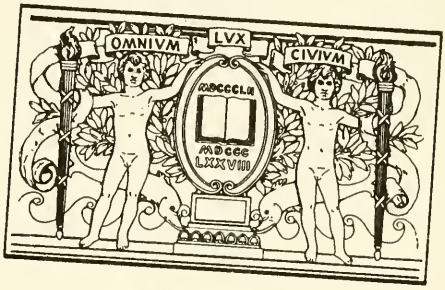
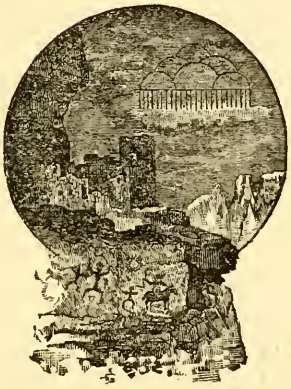


SMITHSONIAN INSTITUTION
BUREAU OF AMERICAN ETHNOLOGY
BULLETIN 116

ANCIENT CAVES
OF THE
GREAT SALT LAKE REGION

BY

JULIAN H. STEWARD



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LETTER OF TRANSMITTAL

SMITHSONIAN INSTITUTION,
BUREAU OF AMERICAN ETHNOLOGY,
Washington, D. C., December 21, 1936.

SIR: I have the honor to transmit the accompanying manuscript, entitled "Ancient Caves of the Great Salt Lake Region", by Julian H. Steward, and to recommend its publication as a bulletin of the Bureau of American Ethnology.

Very respectfully yours,

M. W. STIRLING, *Chief.*

Dr. CHARLES G. ABBOT,
Secretary of the Smithsonian Institution.

CONTENTS

ILLUSTRATIONS

PLATES

MAP

TEXT FIGURES

EXPLANATION OF ILLUSTRATIONS

PLATES

1. *a*, Promontory Point cave formation, seen across cove from Sheehan's Ranch. *b*, View of Caves Nos. 1 and 2. *c*, Mouth of Cave No. 2. *d*, Screening Cave No. 2.

2. Promontory Cave No. 2, 1931 trench after excavation.

3. *a*, Promontory Cave No. 3. *b*, *d*, Promontory Cave No. 5. *c*, Promontory Cave No. 6.

4. *a*, View of Great Salt Lake from above Black Rock Cave showing travertine deposit on rocks. *b*, Mouth of Black Rock Cave. *c*, Cross section of upper end of trench A, Black Rock Cave. *d*, Interior of Black Rock Cave before excavation.

5. *a*, Black Rock Cave, trench A, showing infant burial in situ in lake gravels. *b*, Cross section of 1931 trench, Promontory Cave No. 2. *c*, Crude rock cist, Black Rock Cave. *d*, Infant burial, Black Rock Cave. *e*, Adult burial, Black Rock Cave.

6. Objects from Promontory Cave No. 1. *a*, *b*, Fragments of matting. *c*, Fragment of feather cloak. *d*, *e*, Fragments of coiled basketry. *f*, Cedar bark ring. *g*, *h*, Perforated pottery disks. *i*, Flint end or keeled scraper. *j*, Flint knife; knife handle also used as fire hearth. *k*, Netted hoop probably used in hoop and dart game with *l*, feathered dart.

7. Objects from Promontory Cave No. 1. *a–e*, Moccasins. *f–j*, potsherds; *f*, *h*, *i*, *j*, rims.

8. Objects of bone, horn, and shell from Promontory Cave No. 2. The bone awls are arranged according to depth, *g* being near the surface, *p* the deepest.

9. Petroglyphs near Connor's Springs.

TEXT FIGURES

1. Plan of Cave No. 1, Promontory Point.

2. Cross section of Cave No. 1, Promontory Point.

3. Fire drill and arrow fragments. *a*, Complete fire drill. *b–d*, *f–i*, *m*, *n*, Arrow butts. *e*, Arrow end with fragment of foreshaft. *k*, Socket for foreshaft. *l*, Arrow end with complete foreshaft. *j*, Arrow feather. *c* is 10⅜'' long; all are to same scale.

4. Arrow points of the Promontory culture. *a–e*, *j*, *k*, *o*, *q*, from Cave No. 1; *f*, *l*, from Cave No. 11; *g–i*, *m*, *n*, from Cave No. 7; *p*, from Cave No. 4; *r*, from Cave No. 6.

5. *a*, *b*, *d*, *e*, Arrow smoothers. *b* shows reverse side of *a*. *c*, Pipe.

6. Miscellaneous objects of wood. *a*, End of sinew-back bow. *b*, Foreshaft of fire drill. *c*, Snare(?). *d*, Problematical object. *e*, Bow fragment. *f*, *g*, Fire drill foreshaft. *h*, Wooden tube. *i*, Sinew-wrapped splinter. *j*, Cut fragment. *k*, Wooden peg. *l*, Fire drill foreshaft(?). *m–g'*, gaming pieces(?) of cane. *h'*, Feathered dart. *i'*, Object of wood. *j'*, Bird-bone bead. *a* is 3½'' long; all are to same scale.

7. Netted hoop, probably for hoop-and-dart game.

8. Objects of bone. *a–g*, Gaming bones. *h*, Bone tube. *i*, Cut bone. *j*, Rounded section of rib. *k*, Awl or flint flaker. *l*, Cut fragment of buffalo hoof. *m*, Cut and scratched fragment of scapula. *n*, Perforated disk. *o*, Cut fragment. *p*, Polished fragment of scapula. *a* is 1⅜″ long; all are to same scale.

9. Bone awls and points. *a–c*, *f*, *h*, *k*, *m*, from Cave No. 1; *d*, *e*, *g*, *i*, *j*, from Cave No. 2; *l*, from Cave No. 5. *a* is 6¾″ long; all are to same scale.

10. Methods of finishing mat edges, from Cave No. 1.

11. *a*, Tule mat end. *b*, Bottom of tule bag. *c*, Complete tule mat. *c* is 15½″ long; all are to same scale.

12. Fragment of twined tule bag, 8¼″ tall.

13. Miscellaneous weaving. *a*, Mat fragment from Black Rock Cave. *b*, Fragment of twilled ring basket(?). *c*, Fragment of netting. *d*, Detail of *e*, basketry material woven on rawhide. *f*, Woven band of cord. *g*, Detail of knots employed in *f*. *b*, from Cave No. 2; *c–g* from Cave No. 1.

14. *a–g*, Knots and ties. *h*, Buckskin ornamented with strand of basketry material.

15. Miscellaneous objects. *a*, Incised beaver tooth. *b*, Abalone shell ornaments. *c*, Hoof suspended on quill-wrapped cord. *d*, Decorated bone. *e*, Stick wrapped with rawhide. *f*, Hair tied with bark. *g*, Bead of fossil crinoid. *h*, Juniper-bark ball. *i–k*, Perforated pottery disks. *l*, 3 hoofs impaled on stick. *l* is 8⅜″ long; all are to same scale.

16. Cross section of pot rims. *a–c* (10304, 10580, 10325), *h* (10863), *k*, *l* (11512, 10304), *o* (10304), from Cave No. 1. *f* (11535), *g* (11097), *n* (10349), from Cave No. 2. *d* (11526), from Cave No. 5. *e*, *i*, *m*, *p* (11440), from mound at Provo.

17. Pot rims. *a*, *b* (11512, 10316), *j* (10325), *m–o* (11580, 10304, 10564), *r* (11512), *t*, *u* (10316, 10536), *v–b′* (11512), from Cave No. 1. *d*, *l* (10225), *p*, *q* (10350, 10349), from Cave No. 2. *c* (10863), from cave at Lakeside. *f–i*, *k*, *l*, *s*, *d′* (11440), from mound at Provo.

18. Olla neck and bowl reconstructions. *a* (10304), *c–g* (9510, 10304, 11512, 10304, 9724), from Cave No. 1. *h*, *i* (10349), from Cave No. 2. *b* (11513), from Cave No. 5. *j* (11440), from mound at Provo. *g* is 13″ in diameter; all are to same scale.

19. Pottery decoration. *a* (10304), *n* (9510), and *p* (11512), from Cave No. 1, and *d* (11503), from Cave No. 5, "fingernail" decorated. *b* (10316), *i* (10546), *l* (9724), and *q* (11512), Incised cross hatching, from Cave No. 1. *c* (10316), *e* (10325), *h* (10546), *j* (10546), *k* (9763), *m* (10294), Incised and punched rims from Cave No. 1. *f* (10546), Stuck-on ribbon of clay, from Cave No. 1. *g* (11440), Incised rim, from mound at Provo. *o* (11440), Stick-impressed sherd of pit-lodge type from mound at Provo. *a* is 2½″ long; all are to same scale.

20. Mittens. *a* is of deer or antelope hide, *b*, of buffalo hide. *a* is 8½″ long; both are to same scale.

21. Moccasin construction. *a*, Parts of moccasins; the ticked lines indicate sewed edges. *b*, The four types of stitches used. *c*, A typical moccasin. *d*, The three most common methods of tying moccasins.

22. Three unusual moccasins. *a* (11582–51), Uppers with buffalo hair turned inside. *b* (11582–43), With unusual tie. *c* (10257), With upper sewed to insert and nearly cut away.

23. Special types of moccasin stitches and styles. *a–d*, Gusset or insert stitches on 10241, 9509, 10133, and 11582–5. *e*, Sinew forming secondary stitch, encircling gusset. *f* (11582–64) and *g* (10191), Special style of one-

piece moccasin. *h* (9753), Special style of two-piece moccasin. *i* (10241), Decoration of quill embroidery. *j*, *k* (11582–57), Top and bottom of moccasin patched with deer foot.

24. Woven rawhide (11595).

25. Objects of hide. *a*, Drum head (?). *b*, Fringed cuff (?) section. *c*, Bag bottom. *d*, *e*, Trimmings. *a* measures 15″ by 17½″; all are to same scale.

26. Object of buffalo hide, 24″ long.

27. *a*, One-piece bag of hide of small mammal. *b*, Manner of folding and lacing hide for *a*, represented on smaller scale. *c*, Object of leather.

28. Scrapers of the Promontory culture. *a*, *c*, *g*, *h*, *j*, End scrapers from Cave No. 1. *f*, End scraper from Cave No. 7. *d*, *e*, *k*, End scrapers from Cave No. 11. *b*, Chipped flint scraper, and *i*, two retouched flakes from Cave No. 1. *f* is 2″ long; all are to same scale.

29. Broken flint scraper, probably end-scraper type, hafted on bone handle, tied with rawhide. Length, 4⅝″.

30. Slate blades and chipped flint drills. *a*, from Cave No. 4, and *b*, *c*, *g*, from Cave No. 1, are slate blades. *d*, *e*, from Cave No. 1, and *f*, from Cave No. 3, are drills. *a* is 3½″ long; all are to same scale.

31. Chipped flint knives. *a–d*, *f*, *h–j*, from Cave No. 1. *e*, from Cave No. 4. *g*, from Cave No. 3. *c* is 2⅞″ long; all are to same scale.

32. Wooden knife handles. *a*, *c*, *d*, from Cave No. 2. *b*, *e*, *f*, from Cave No. 1. Solid black represents glue; dotted lines represent extent of notch. *f* is 5½″ long; all are to same scale. *b* and *d* also had been used as fire hearths.

33. Etched slabs of slate. *a*, *c*, *f*, *g*, from Cave No. 3. *c* has retouched edges; *g* bears traces of red paint. *b*, *d*, and *e* (both sides of same slab), from Cave No. 1. *a* is 4″ long; all are to same scale.

34. Incised and etched limestone slabs from caves near Blue Creek Station, northern end of Promontory Point. *a* is 4″ long; the others are to the same scale.

35. Slate point from Cave No. 4. Left-hand figure shows complete design.

36. Mullers. *a*, *c*, *e*, from Cave No. 1. *b*, from Cave No. 5. *d*, from 2½′, and *f*, from 4′ to 4½′ deep, in Cave No. 2. *a* is 10½″ long; all are to same scale.

37. Pictographs on Promontory Point. *a*, *b*, Kachina-like figures, and *c*, sheep in Cave No. 1. *d–h*, Groups on eastern side of point. *a* is 15″ tall; all are to same scale. All are red.

38. Petroglyphs near Connor's Springs, arranged in original groups.

39. Plan of Cave No. 2.

40. Cross section of Cave No. 2.

41. Projectile points from Cave No. 2. *a–i*, 24″ to 30″ deep. *j–m*, 30″ to 36″ deep. *n*, 30″ to 40″ deep. *o*, *p*, 42″ to 48″ deep. *q*, *r*, 48″ to 53″ deep. *s–v*, 59″ to 65″ deep. *w–y*, 65″ to 71″ deep. *z*, 71″ to 77″ deep. *a′*, lowest level. *s* is 3¾″ long; all are to same scale.

42. Small scrapers from Cave No. 2. *a–d*, 24″ to 30″ deep. *e*, 30″ to 42″ deep. *f–h*, 42″ to 48″ deep. *i*, 48″ to 53″ deep. *j*, 53″ to 59″ deep. *k*, *l*, 59″ to 65″ deep. *m*, 77″ to 79″ deep. *a* is 1⅝″ long; all are to same scale.

43. Knives and scrapers from Cave No. 2. *a–f*, 24″ to 30″ deep. *g*, 30″ to 36″ deep. *h*, 30″ to 42″ deep. *i*, *j*, 42″ to 48″ deep. *k–m*, 48″ to 53″ deep. *n*, 53″ to 59″ deep. *o*, *p*, 59″ to 65″ deep. *q*, 65″ to 71″ deep. *a* is 2¼″ long; all are to same scale.

44. Plan and cross section of Black Rock Cave.

45. Cross section of Black Rock Cave, trench A.

46. Knives and scrapers from Black Rock Cave. *a*, Knife with burial in rear of cave. *b*, Knife from trench B, surface to 4″ deep. *c–i*, from trench A. *c*, *d*, 8″ to 10″ deep. *e*, *f*, 14″ to 19″ deep. *g*, 24″ to 29″ deep. *h*, *i*, 45″ to 49″ deep. *j*, *k*, with burial in trench B. *l*, Trench B, 23″ to 29″ deep. *m*, Trench B, 29″ to 32″ deep. *a* is 4⅜″ long; all are to same scale.

47. Projectile points from Black Rock Cave. *a*, Obsidian arrow point with burial in rear of cave. *b–g*, *j*, *l*, *m*, Quartzite dart points from trench A. *b*, 8″ to 10″ deep. *c–e*, 10″ to 14″ deep. *f*, *g*, 14″ to 19″ deep. *j*, 19″ to 24″ deep. *l*, *m*, 32″ to 36″ deep. *h*, Flint point 20″ deep, between trenches A and B. Remainder are trench A. *i*, 19″ to 24″ deep. *k*, 29″ to 32″ deep. *n*, 45″ to 49″ deep. *o*, *p*, 49″ to 54″ deep. *a* is 1½″ long; all are to same scale.

48. Miscellaneous objects from Black Rock Cave. *a*, *c*, *e*, from trench A. *a*, Clay pellet, 29″ to 32″ deep. *c*, Bone point, 10″ to 14″ deep. *e*, Abalone shell ring, 10″ to 14″ deep. *b*, Incised rodent tooth, trench C, surface to 9″ deep. *d*, Steatite arrow straightener(?), with burial, trench B. *f*, Cut bone, trench B, 32″ to 36″ deep. *d* is 2¾″ long; all are to same scale.

ANCIENT CAVES OF THE GREAT SALT LAKE REGION

By Julian H. Steward

INTRODUCTION

Archeological field work of the University of Utah in 1930 and 1931 was carried on in the vicinity of Great Salt Lake, attention being devoted to caves which had once been submerged by Lake Bonneville. As test pits showed that certain of these had been occupied by human beings when the subsidence of the lake first left them dry and habitable, the work was pursued with the aim of discovering ancient cultures which could be dated by reference to the chronology of the lake. Although absolute age estimates in this matter are subject to the usual reservations involved in geological reckoning so that they can serve only as working hypotheses, and although future geological and archeological research may require a radical revision of these estimates, the stratigraphic relationship of artifacts in individual sites and the correlation of the sites with stages of Lake Bonneville will always remain valid. The paucity of artifacts unfortunately prevents adequately defining the earliest cultures, but it is felt that, in view of the great gap in the archeological record between the ancient Gypsum Cave and Basket Maker cultures of the Southwest and the serious lack of other archeological data from the Great Basin, they should be placed on record with tentative estimates of their antiquity.

Chronology of Lake Bonneville.—Preliminary to a description of the individual caves and cultures, geological facts which are pertinent to the question of chronology will be considered. The early epochs of Lake Bonneville are complex and imperfectly known and are irrelevant to our problem. We are concerned merely with its last great rise and subsequent recession.[1] At its greatest depth, Lake Bonneville stood 1,000 feet above the level of Great Salt Lake, where it eroded a clearly marked shore line known as the Bonneville

[1] The data concerning Lake Bonneville are derived mainly from the researches of G. K. Gilbert, 1882 and 1890.

terrace. At this time, however, it overflowed and then cut through a dam of relatively soft gravels in Cache Valley, flowing out to the Columbia River. This drained the lake so rapidly that it cut no clearly defined terrace until it had dropped 375 feet. Conditions which had caused its rise evidently continued so long that it remained at this height, 625 feet above Great Salt Lake, still draining to the sea, and cut the largest and most easily recognized of all shore lines, the Provo terrace.[2]

That this rise to the Bonneville level, overflow, and subsequent drop to the Provo level were concomitant with the maximum of the final Pleistocene glacial period has been, if not established beyond all doubt, generally postulated by geologists.[3] In terms of years, this glacial maximum is presumed to have endured from about 40,000 to 25,000 years ago.[4] A number of thousand years must, however, be allowed for the inaccuracies of such a broad estimate and for the possibility that fluctuations in Lake Bonneville were not precisely correlated with changes in the continental glaciation.

The reduction of Lake Bonneville subsequent to its maintenance at the Provo level is not a phenomenon of drainage but of increased desiccation of the lake and of diminishing water feeding the lake, which occurred during the post-glacial period. No doubt this shrinkage was somewhat uneven, occasionally being halted temporarily when the lake maintained its level or even rose slightly. It may be assumed, however, that the desiccation was, in general, continuous, for the only well-defined shore line below the Provo terrace is the Stansbury terrace, which is about midway between the former and the level of Great Salt Lake, or about 300 feet above the latter.

If the maximum of the glacial period passed 25,000 years ago it does not seem unreasonable to assume that Lake Bonneville began to subside from the Provo terrace at least 20,000 years ago. If it required the whole of this time to shrink down to Great Salt Lake, and if the rate of shrinkage were even, then it must have reached the Stansbury terrace about 10,000 years ago. To this, however, the length of time required to cut the Stansbury terrace should be added. Moreover, Great Salt Lake may have existed in its present condition for several thousand years. These considerations would require the addition of a few thousand years to the estimate of time elapsed since Lake Bonneville was reduced to the Stansbury level. On the other hand, such possible factors as accelerated desiccation in recent millenniums might require the reduction of this estimate. Any error,

[2] Gilbert, 1890, pp. 126–127.

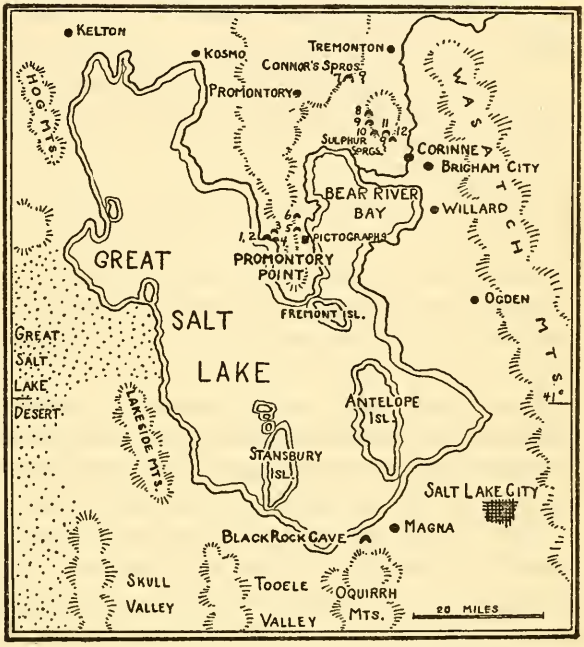
[3] Gilbert, 1890, p. 318; Antevs, pp. 74–77.

[4] Antevs, 1925, pp. 77, 101, places the height of the last ice age at 30,000 to 35,000 years ago.

however, in a tentative acceptance of 10,000 years is likely to be one of conservatism.

CAVES INVESTIGATED.—The largest group of caves investigated is on Promontory Point and the northern shore of Great Salt Lake, where tilted and folded strata of limestone were a prey to wave erosion. Although less common elsewhere, caves occur on almost every range in northern Utah which had been reached by Lake Bonneville. (See map 1.)

The exploration of these caves was under the direction of the writer and was financed jointly by the University of Utah and the Bureau of American Ethnology from the Smithsonian fund for cooperative field work in anthropology. The program comprised thorough excavation of two large caves on the western shore of Promontory Point and one large cave near the old Black Rock bathing resort on the southern shore of Great Salt Lake, and reconnaissance of other caves on Promontory Point and the northern shore of Bear River Bay in the vicinity of Little Mountain.



MAP 1.—The Great Salt Lake region.

It was deemed advisable to excavate completely the large caves rather than carry on a more extensive reconnaissance, as amateur enthusiasm had reached such a pitch that it was extremely doubtful whether their deposits would escape destruction another year.

In September 1930, therefore, test excavations were made in the two large Promontory Caves, Nos. 1 and 2. In July and August 1931 investigation of these was completed and the Black Rock Cave also thoroughly excavated. During this time other caves on the northern shore of Great Salt Lake were examined.

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Cave No 1 is located on the western shore of Promontory Point, about 10 miles north of the Lucin cut-off of the Southern Pacific Railroad which touches the point in crossing Great Salt Lake (pl. 1, *a*, *b*). A poor dirt road up the western side of the point passes the old Sheehan's ranch and terminates at an airways beacon station just beyond. The cave lies slightly more than a mile beyond the station in a cliff overlooking a small cove, and facing a little east of south. It yielded the bulk of the artifacts mentioned in this paper. These belong to a single relatively recent period which will be designated the Promontory culture. The cave is described more fully below.

Cave No. 2, just below Cave No. 1, is, because of its stratigraphic features, also described below.

Cave No. 3 (pls. 1, *a;* 3, *a*) is about a mile east of and much higher than Cave No. 1, lying just above the Provo terrace of Lake Bonneville, in a limestone cliff under the air beacon. It is nearly a hundred feet deep, but has an enormously high mouth and a floor which slopes outward so steeply that occupation was possible only in very restricted areas. From a few inches to 2 feet of cultural remains had accumulated in several portions, but as the actual quantity of this material was slight, it was easily excavated in a short time. The artifacts show that the only culture represented is like that in Cave No. 1.

Cave No. 4 (pl. 1, *a*) is a small rock shelter on the present shore of Great Salt Lake a few hundred yards from the air-beacon houses. This served only as a temporary shelter and contained but few objects, all of which belong to the Promontory culture.

Cave No. 5 (pl. 3, *b*, *d*) lies on the eastern side of Promontory Point, at the end of a pass which crosses to Sheehan's ranch on the western side. A brief examination showed that it was but little occupied and contained nothing of great antiquity, having only traces of the Promontory culture.

Cave No. 6 (pl. 3, *c*), near No. 5, also contained little besides traces of the Promontory culture. It would, however, be profitable to spend a day or two excavating these and several other small shelters in the vicinity.

Cave No. 7 is a very small cave about 1 mile west of Connor's Springs. It contained but little evidence of occupation, yielding only a few potsherds and side-notched arrow points of the Promontory culture. A short distance from it are faint red pictographs.

Cave No. 8 is a rock shelter, rather than a cave, located just under the Stansbury terrace about 2 miles north of the highway on the eastern side of Little Mountain north of Bear River Bay. Exposed

deposits at the foot of a cliff bearing red pictographs contain potsherds of the Promontory type and evidences of hearths. A day or two should be spent excavating the 24 inches or so of refuse here.

Cave No. 9 is a small cave facing west on the same side of the range as No. 8, about 1 mile north of the highway. It yielded a potsherd of the Promontory type and could be excavated in one-half day.

Cave No. 10 is a small cave on the southern side of the same range, a short distance from the sulphur springs. It contained only a small amount of refuse, yielding broken bones and evidence of fire.

Cave No. 11 is small and lies a short distance east of No. 10, at about the Stansbury terrace. The deposits are very dry but not deep, and could be excavated in a day and a half. Obsidian points and potsherds show that it contains the Promontory culture.

Cave No. 12, also very small, is just above the sulphur springs, and contained only traces of fire.

Other caves on the northern shore of Bear River Bay are reported by Mr. Fridal, of Tremonton, Utah, to contain evidence of the Promontory culture in the form of flints, potsherds, and even moccasins. Many of these would no doubt repay careful investigation.

During the work in 1931 Mr. Dean Brimhall, of Ogden, Utah, kindly made it possible to explore the Promontory Point and Bear River Bay region by airplane. This plane flew to the landing field near the railroad station at the southern end of Promontory Point, where it picked up the writer. We flew north over Promontory Point, thence east along the hills north of Bear River Bay to Brigham City, and finally straight back to the landing field on the point, thus covering, in an hour or so, country that would have required days to explore on foot. This reconnaissance revealed that for several miles north of Caves Nos. 1 to 4 the rock strata on the western side of the point are greatly faulted and folded and contain a large number of caves of all sizes. Another region which appeared to be rich in caves is the country at the eastern side of the northern end of Promontory Point, where the highway and railroad from Blue Creek cross the range. Other caves seem to be scattered throughout the ranges to the north. Flying low over the marshes bordering Great Salt Lake, we sought to discover puebloan pit-lodge mounds, but were completely unsuccessful in this, even where we knew mounds to be located. The writer wishes to express his deepest appreciation of Mr. Brimhall's kindness in making this trip possible.

Other caves are located in the Hog Mountains, northeast of Great Salt Lake. The writer has not visited these, but is informed by Mr.

Charles Kelly that they contain deposits of some depth which would repay careful excavation.

Of all the caves, that at Black Rock is most interesting from a stratigraphic point of view, because it is highest above Great Salt Lake and was therefore left habitable earliest by the recession of Lake Bonneville, and because it proved to have stratified cultural remains, the lowest of which rested directly upon lake gravels. From the point of view of richness, Cave No. 1 on Promontory Point is the most interesting, as it contained, in its upper levels, extremely abundant remains of a culture which is entirely new, although comparatively recent. Stratigraphically, however, it was disappointing, for the deposits were shallow and the lower strata contained little evidence of human occupation. Cave No. 2, although only a short distance above the present lake level, had, under a surface culture which is identical with that in Cave No. 1, older remains extending down to lacustrine gravels.

The specimens collected in the course of these investigations are in the Museum of Anthropology, University of Utah, the catalogue numbers of which are given in this paper.

The writer wishes to express his gratitude to Mr. Charles Kelly, of Salt Lake City, for bringing to his attention and guiding him to the Promontory and Black Rock Caves and other prehistoric sites and for his enthusiastic participation in much of the work. He is also grateful to Dr. Walter Cottam, Dr. Ralph Chamberlain, Mr. Elmer Berry, and Mr. O. Whitney Young, of the University of Utah, and Miss Edna Fisher, of the Museum of Vertebrate Zoology of the University of California, for the identification of plant and animal specimens; to Mr. Barnum Brown, of the American Museum of Natural History, for accompanying him to the Black Rock Cave so as to examine its geological and stratigraphic features, and to Dr. F. J. Pack, of the University of Utah, for accompanying him to the Promontory Cave No. 1, to examine its geological features; to Miss Elizabeth Ryan, of the University of Utah, for her assistance in the laboratory study of the specimens; to Mr. Fridal, of Tremonton, for guiding him to a number of rock shelters and for donating a number of specimens from Cave No. 1 to the University Museum.

In the following presentation of material the culture of Cave No. 1 will be described first. As the artifacts from the most recent period of Cave No. 2 and from Caves Nos. 3 to 11 belong to this same culture, they will also be considered in this section. Following this, the stratification of older cultures in Cave No. 2 and in the Black Rock Cave will be presented.

Specimen numbers are those of the catalogue of the Museum of Anthropology of the University of Utah.

CAVE NO. 1, PROMONTORY POINT

The earliest published record of Cave No. 1 is a brief description of its surface remains by Cummings,[5] who noted the large number of moccasins, buffalo bones, and pottery, the last of which he erroneously believed to resemble the sherds at Willard, a puebloan pit-lodge site on the eastern shore of Bear River Bay. The late Prof. A. A. Kerr, of the University of Utah, visited the cave some years later, but so far as is known he never undertook to explore it systematically. In fact, probably no specimens from it found their way into museums prior to the 1930 and 1931 investigations of the University of Utah. Judd mentions it in connection with his extensive explorations in western Utah,[6] but he did not visit it. In recent years, however, the existence of the cave has become generally known and it has been visited by many amateurs who did considerable damage.

In the course of ethnographic research during 1935 and 1936 among the Shoshoni who, a century ago, occupied the country on all sides of Great Salt Lake, an informant was found at Washakie, Utah, who claimed to have been born in a cave on the western side of Promontory Point a few miles north of Cave No. 1 and to have lived in Cave No. 1 at various times during his youth. This informant, Old Diamond, and his sister, Posiats, both asserted that at one time the Gosiute, who are a division of the Shoshoni occupying the deserts south of Great Salt Lake, besieged their people in Cave No. 1 and attempted to smoke them out. The writer suspects, however, that this story may be merely a tradition that has become connected with a large number of caves in the Great Basin. A similar tale was told of Lovelock Cave in Nevada. A Gosiute informant, Moody, had also heard the story but laid the blame on the Ute of Utah Lake. If it is true, it is probable that the raiders were Ute, who had horses and a disposition to rove and to make war, rather than Gosiute, who would have had great difficulty in traversing the intervening deserts on foot and who would have had no conceivable motive for raiding their close kin.

Whether this account be true or not, there is little question that the Shoshoni occasionally wintered in suitable caves instead of building their customary conical pole lodges and that caves also frequently served as temporary shelters. It would be expectable, therefore, that the ethnographic picture of Shoshoni culture should bear a close resemblance to that provided by the objects of the uppermost stratum of each cave. The remarkable lack of correspondence of these pictures is treated in a subsequent chapter.

[5] 1913.
[6] 1926, p. 10.

Cave No. 1 lies at the base of a badly faulted, folded, and greatly metamorphosed cliff of limestone. It was eroded largely by wave action of a point of weakness produced by unusual faulting. The cave was 262 feet above the level of Great Salt Lake in August 1931, a time of abnormally low water, or slightly below the Stansbury terrace. A slope, partly of talus and partly of exceedingly rough outcroppings of limestone, drops steeply away in front of it.

The interior of the cave is 125 feet deep, 155 feet wide, and opens out to the exterior through a mouth which is 75 feet wide (fig. 1). The ceiling, which slopes up from each side somewhat tent-fashion,

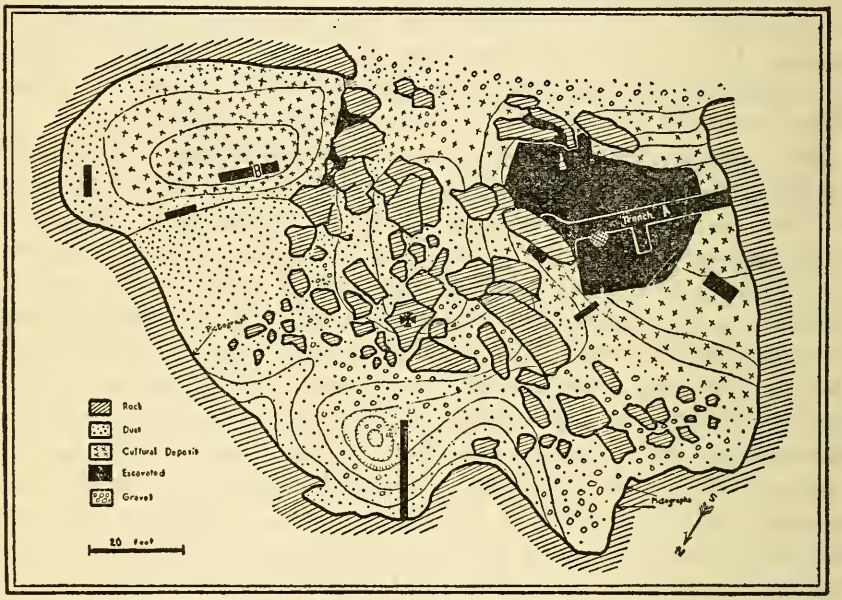


FIGURE 1.—Plan of Cave No. 1, Promontory Point.

is about 50 feet high in the center. A great rockfall lies in the center of the floor, dividing it into two habitable parts, one of which is between the rockfall and the western wall just inside the mouth; the other, to the east of the rockfall, is somewhat damper, darker, and shows less evidence of occupation. The remainder of the cave floor is strewn with huge boulders, so that only here and there are traces of occupation. On the rear and eastern walls are pictographs described below.

As the cave is just below the Stansbury terrace (which is difficult to trace in this locality), the subsidence of Lake Bonneville may have left it dry and habitable at least 7,000 or 8,000 years ago. In view of this, it was hoped that below the comparatively recent culture which lies on and near the surface and which is described

in the bulk of this paper, older cultures might be encountered. Accordingly, trenches were dug at several points down to the lacustrine beach deposits of stratified sands and gravels, but only the slightest traces of human occupation were noted below a depth of 2 feet. Further excavation of the lower strata in search of artifacts which would characterize the cultures of the earlier occupation was deemed inadvisable, as a large crew would have required many months properly to clear the entire cave down to bedrock or to lake deposits. Attention was therefore devoted to the upper 2 feet of culture-bearing deposits, to rock crannies, and such other places as test pits indicated to be worth investigating. The lower deposits still remain undisturbed, except for the test trenches, and may in the future be excavated by some institution having the means to do so.

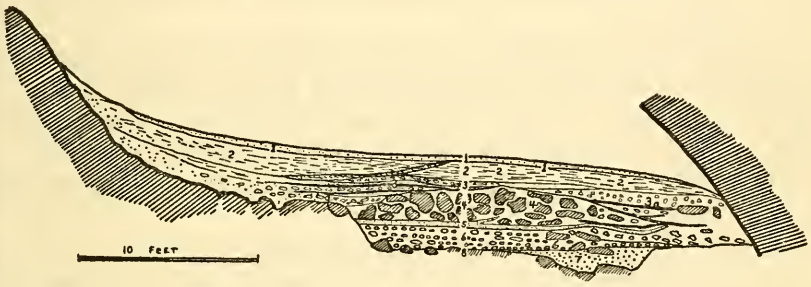


FIGURE 2.—Cross section of Cave No. 1, Promontory Point.

For the sake of completeness, a cross section of the deposits found in trench A is given here (fig. 2). The following numbers refer to the strata in figure 2:

1, 4 to 6 inches of cow manure (the cave could shelter several dozen head of cattle).

2, approximately 24 inches of refuse, rich in cultural remains, thinning out on the edges of the area in which most living was carried on. This material is exceedingly fibrous, containing juniper bark, hair from scraped hides, straw, scraps of hide, many bones and bone fragments, and all manner of objects. In places it is partially cemented with a calcareous deposit formed by drippings from the ceiling. Here and there is evidence of fire, and at one point (fig. 1) is the main fireplace, which, however, lacks special form and was not even walled off from the fiber. This is 2 feet deep and evidently was used during the whole period of occupation. It appears that living was carried on in this area, juniper bark being brought in for beds, where it still appears in layers 4 to 6 inches thick, and the refuse of meals and manufacturing being dropped on the spot. The great bulk of the specimens described in succeeding pages came from this level.

3, 3 to 4 inches of fibers, dust, and angular gravel, which had evidently fallen from the ceiling. No artifacts. The deposits are somewhat more complicated at the eastern end of the trench. Under the gravel, stratum 3, is 1 inch of yellow dust, perhaps sheep manure, below which is 1 inch of charcoal and ash, then 1 inch of fibrous material, then another 3 inches of angular gravel and fiber, then 1 inch of charcoal, then 3 inches of disintegrated sheep(?) manure.

3a is like *3*. Between it and stratum 4, however, are bands of charcoal alternating with layers of gravel, dipping down somewhat lower than in the central and eastern parts of the trench.

4, 20 to 24 inches of large boulders, perhaps brought down from the roof during an earthquake. A thin band of charcoal running partially under these rocks at the western end of the trench, and only 6 inches above beach gravels, may indicate human occupation at an early period.

5, 3 inches of yellow dust, apparently disintegrated sheep manure, as indicated by a number of only partially decayed lumps.

6, 10 to 12 inches of gravels, no doubt lacustrine beach deposits, which are rounded, especially toward the bottom of the stratum.

7, 16 inches of fine grayish sand, which is coarser at the bottom but is not bedded.

8, large rocks, either boulders from the roof or bedrock.

The stratification of trench B, on the opposite side of the cave, is substantially like that in trench A, lake deposits lying at a depth of 5 feet. Elsewhere in the cave only dust containing occasional rocks was encountered in the trenches shown in figure 1 and in various test pits not indicated.

Excavation of those areas which bore artifacts was largely a matter of peeling off layers of matted bark and other materials. The excessive quantities of fiber made screening impossible. Depths and locations were recorded, but as the culture was entirely homogeneous at all depths and in all parts of the cave, these data have been omitted from the descriptions below. In short, a single culture is represented and the abundance and variety of artifacts indicate use of this site as a relatively permanent home.

The duration of occupation, however, cannot be determined. Certain features even suggest that the cave was occupied seasonally rather than perennially. The great abundance of animal, particularly buffalo, remains and the total lack of horticulture show that they were hunters. The nearest water is seep springs at Sheehan's ranch, more than 2 miles away, and there is not the slightest reason to believe that closer water was available when the cave was inhabited. It would, however, make an ideal camp in winter for a group of bison hunters, when snow could be melted down for water.

Arrows and Arrow Points

All arrow shafts, with few exceptions, e. g., 11602–14 (fig. 3, *d*) and 11541–12 which are hardwood, are of cane (*Phragmites communis* Trin.). They vary from 3/16″ to 3/8″ and average 5/16″ in diameter at the feathered end and slightly larger at the other end. No complete specimens were obtained from which the length could be ascertained. The butt has a V- or a U-notch which is 1/8″ to 5/16″ deep, and which, when possible, is cut where a natural joint occurs in the cane, as in 10397 (fig. 3, *b*). One specimen, 10400 (fig. 3, *n*), has a small wooden plug inserted in the hollow butt of the cane as if to strengthen it. All specimens are wrapped with sinew just below the notch, that is, 1/4″ from the end of the shaft, to prevent splitting. Even 11602–32, a hardwood shaft, has such wrapping just below the notch.

All arrows have three feathers, identified as probably goose, turkey buzzard, great horned owl, and gull, and possibly pelican and eagle. They vary considerably in length, the wings (the projecting part) ranging from 2⅞″ to 7″. The upper ends of the wings come within 1″ to 2″ of the butt. The manner of preparing the feather is shown in figure 3, *j*. The shaft is split to within 1/2″ to 1″ of the upper or distal end of the feather where the barbs are left on both sides to be bound against the cane with sinew wrapping. 1/2″ to 1″ of the lower end of the feather shaft is stripped of barbs and is lashed to the cane with sinew (fig. 3, *c*, *d*, *f*, *g*, *i*). In no instance is the feather first fastened so as to project forward and then folded back over the binding, as among certain modern tribes, but in one specimen, 11602–14 (fig. 3, *d*), the end of the feather shaft seems to have been folded back under the lashing and projects through the sinew. The upper end of the feather is bound by a solid wrapping (fig. 3, *d*, *h*, *n*), an open spiraling wrapping (fig. 3, *g*, *i*), or several separate bands (fig. 3, *c*, *m*) of sinew. In no instance do the feathers definitely spiral. The only specimens with decorated feathers are 11602–38, in which the lower ends of the feathers are clipped with two notches each, and 11550–5, which bears traces of red paint. 11602–38 also differs from most others in that the barbs are left on both sides of the feather shaft for 5/8″ below the upper binding.

The shafts of a few arrows are decorated in the region of the feathers. 10444 (fig. 3, *f*) has traces of red paint on the cane at the point of the upper feather binding, below which is a narrow dark band. 11602–1 (fig. 3, *h*) is decorated with a fine spiraling incised line. 10446 has stains around the upper feather wrappings which are either paint or the remains of glue. 10611 (fig. 3, *m*) has spots of dark paint near the butt. 11550–1 has, on the 1/2″ of

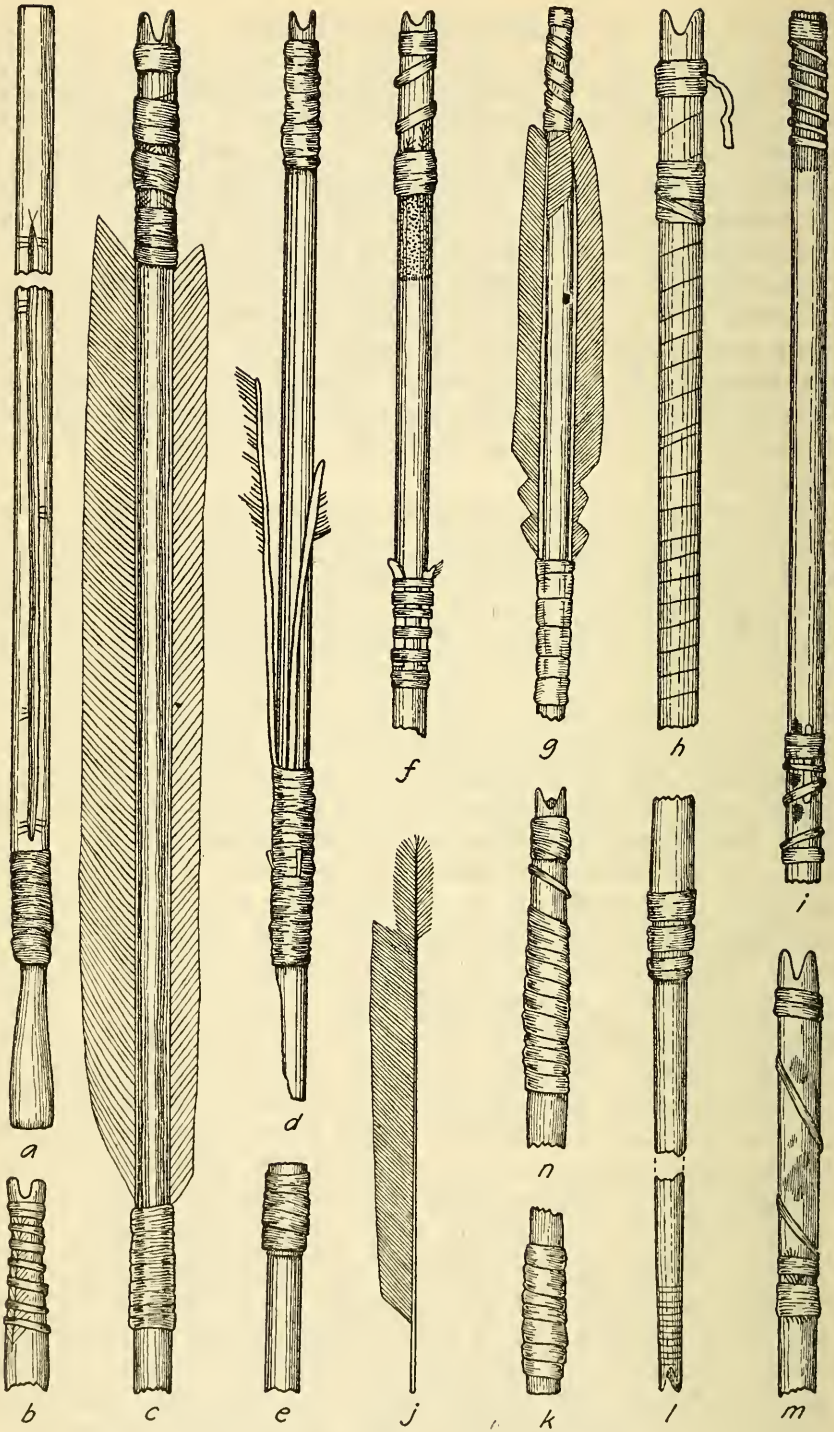


FIGURE 3.—Fire drill and arrow fragments.

bare cane between the upper feather binding and the wrapping around the butt, 13 fine longitudinal incised lines. 10397 is painted red around the upper feather binding.

Foreshafts are of hardwood, probably rabbit brush (*Chrysothamnus* sp.?) or elderberry (*Sambucus* sp.?). They are about ¼″ in diameter and range from 3″ to 12″ in length. One end is tapered for ¾″ to 1½″ for insertion in the socket at the end of the cane shaft (fig. 3, *e*, *l*). The cane is tightly wrapped with sinew for ½″ to 1″ at the end around the socket to prevent splitting. The other end of the foreshaft has, when a stone point was added, a deep notch. In 11541–11 discoloration of the foreshaft shows that the sinew wrapping and probably glue which held the stone point extended back ⅞″ from the tip. A few foreshafts merely taper to a rather blunt point and do not have a stone tip.

The usual form of the arrow point is an elongated triangle which bears a small notch on each side and one on the base (fig. 4, *c*, *d*, *e*, *g*, *h*, *i*, *j*, *l*, *m*, *p*). This form has been found at certain modern Shoshonean sites in the vicinity of Great Salt Lake but also occurs in pit lodges of a puebloan culture.[7] It is, however, quite unlike both the early dart points and later arrow points from Lovelock Cave, Nevada.[8]

Specimens of arrow butts from Cave No. 1.—These are of cane unless otherwise noted. 10565 (fig. 3, *c*), length, 10⅜″; 3 feathers; wing ⅜″ wide, 7″ long; lower feather binding extends 15/16″; upper binding extends 1¼″ to within 2″ of butt; notch is ¼″ deep, below which is ¼″ of wrapping. 11602–14 (fig. 3, *d*), butt of hardwood with pithy core; fragments of 3 feathers; lower feather binding extends 1½″, but feather shafts project backward through the middle of this wrapping. 10444 (fig. 3, *f*), fragments of 3 gray feathers; upper feather binding is ¼″ wide, then spirals to butt; slightly decorated with paint as described above. 10463, fragment like last but lacks paint and is broken below upper feather binding. 11602–38 (fig. 3, *g*), possibly goose feathers; butt broken off. 11602–1 (fig. 3, *h*). 10446 (fig. 3, *i*), notch is at joint in cane; trace of dark paint at feather wrappings; feathers possibly spiraled slightly clockwise. 11602–3, stubs of feathers remain. 10611, length, 3⅜″; diameter, 5/16″; upper feather binding extends from 2¾″ to 2¼″ from butt, then spirals to under notch; notch, ¼″ deep; traces of dark paint or glue. 10633, length, 2¼″; upper feather binding extends from 2″ to ⅜″ from butt; notch 5/16″ deep just above cane joint. 10616, 11602–20, 10639, and 11602–12 are fragments much like the last. 10625, fragment; feather wing length, 4½″; lower feather binding extends 1⅜″. 10610, fragment; diameter, ¼″; lower feather binding extends 15/16″. 9643, length, 3¼″; upper feather binding extends from 3″ to ¼″ from butt; extra wrapping under notch for ½″. 9644, length, 2⅛″; diameter, 5/16″; upper feather binding extends from 1½″ to ¼″ from butt; notch, 3/16″ deep. 10400 (fig. 3, *n*), butt has wooden plug inserted in notch. 10397 (fig. 3, *b*), broken 2¾″ from end; tightly wrapped sinew spirals for 1″ from end; painted red; square notch. 10393, di-

[7] Steward, 1933 b.

[8] Loud and Harrington, 1929, pp. 97–98, 108.

ameter, 5/16"; notch is at cane joint; sinew binding had been put over paint or glue. 9571–d and 10379, fragments; deep notch just beyond cane joint. 9592, cane fragment with remains of one gray feather. 10380, fragment; upper feather binding extends 1¼" to butt; notch, ¼" deep. 10758, diameter, 5/32"; feather wing length, 2⅞"; notch at cane joint. 10759, diameter, ⅜"; feather wing length, 4⅛"; lower feather binding extends 2⅞", over red and black glue; notch at cane joint. 9653, fragment; lower feather binding extends ¾"; three feathers. 10567, fragment; stubs of two turkey buzzard(?) feathers. 9670, notch depth, ⅜". 11602–32, hardwood butt; length, 6½"; diameter, ¼"; sinew bound just under notch, like cane butts. 11602–16, ⅜" wrapping under notch; notch depth, ¼". 11602–7, hardwood shaft; length, 12"; diameter, 5/16"; remains of sinew wrapping; probably arrow butt. 10450 and 10457, fragments; notch depth, ¼"; sinew wrapped for ½". 11602–13, fragment of butt (?); covered with red paint. 11602–18, 11602–9, 11602–28, 10408, 10477, 9571–c, 9638, 10421, and 9591 are fragments of broken cane wrapped with sinew which were probably parts of arrow shafts. 10368, arrow feather with split shaft; wing length, 6¾"; width, ½". Another arrow feather 4½" long has a wing 3" long.

Specimens of arrow butts from Cave No. 2.—11541–6, diameter, 5/16"; feather wing length, approximately 4"; upper feather binding extends from 1½" to ¼" from butt; traces of dark paint or glue. 11541–12, butt of solid wood twig; diameter, ¼" to 7/32"; lower feather binding extends from 8¼" to 9⅞" from butt.

Specimens of arrow butts from Cave No. 3.—11550–4, length, 2"; upper feather binding extends from 1¼" to ¾" from butt; butt wrapped for ⅛". 11550–5, lower feather binding extends 1"; stubs of three feathers bear traces of red paint. 11550–2, cane fragment with great horned owl feather. 11550–1, length, 2"; goose-feather fragment; feather wing width, ⅜"; upper feather binding extends ⅞"; ½" of bare cane between the upper feather binding and the wrapping under the notch is decorated with 13 longitudinal incised lines.

Specimens of foreshafts and foreshaft sockets from Cave No. 1.—11602–17 (fig. 3, *e*), smoothed hardwood; diameter, ¼"; tapered point inserted ¾" into cane socket; other end broken; cane diameter, ⅜"; cane is sinew wrapped for ⅝". 10871, smoothed hardwood; length, 6"; diameter, ¼"; point plain; inserted 1⅜" into cane socket; cane diameter, 5/16". 9628, smoothed hardwood; length, 4½"; diameter, ¼"; inserted 1¼" to 1½" into cane socket, somewhat splitting it; other end broken and sinew wrapped; cane diameter, ⅝"; cane is sinew wrapped. 10448, smoothed hardwood; length, 6⅞"; diameter at butt, 5/16"; tapers to ¼" diameter at tip which has notch 3/16" deep for stone head; marks 2" from tip indicate incipient cuts. 10318, well smoothed hardwood; length, 9"; diameter, 5/32"; one end broken; other has shallow notch, below which on each side of shaft are two shallow grooves. 10470, unusually well smoothed hardwood; length, 12¼"; tapers from 5/16" diameter at broken butt to 3/16" at point which has notch 3/16" deep for stone head; sinew for binding head ran back 1⅜" from end. 9639, smoothed hardwood; diameter, ¼"; one end blunt; other broken. 10542, smoothed hardwood; length, 6⅛"; diameter, 5/16"; tapers to point which has been cut off. 9766, broken hardwood shaft; length, 8½"; diameter, ⅜"; end blunt. 10449, hardwood; length, 6⅜"; diameter, 5/16"; 1½" of butt trimmed down to ¼" diameter, probably for insertion into cane socket; point probably broken. 10362, hardwood; length, 9⅞"; diameter, 5/16"; one end notched shallowly for stone head; other end cut square and encircled by shallow groove. 11602–30, hard-

wood; length, 8″; diameter, 5/16″; point blunt; other end broken; 6¼″ from point there is 1¼″ of sinew wrapping. 11602–11, hardwood; length, 6¼″; diameter, ¼″; point blunt; spiraling scratches show that the smoothing was accomplished by rotating while drawing back and forth on a gritty surface. 11600–1, polished hardwood; length, 5″; diameter, 5/16″; one end broken; other tapers to blunt point. 11602–23, fragment hardwood shaft of rabbit brush (*Chrysothamnus* sp.?); diameter, ¼″; notch and traces of sinew at one end. 11602–24, like last; cut 4¾″ from notched end; no sinew. 10451, hardwood; length, 8⅜″; diameter at broken butt, ¼″; tapers to point at other end. 10403, knotty twig; length, 7½″; diameter, ¼″; one end notched and sinew-wrapped for 1″.

The following are cane fragments, having one end broken, the other cut squarely across and bound for a short distance with sinew. These are probably foreshaft sockets. 9652, diameter, 7/16″; bound for ½″. 9629 and 9650, diameter, ⅜″; bound for ¼″. 9649, diameter, ⅜″; bound for ¼″. 9645, crushed cane; bound for ⅜″. 9565 and 10466, diameter, ⅜″; bound for ½″, so tightly as to compress cane. 10416, diameter, 5/16″; heavily bound for 1¼″. 11602–36, diameter, ⅜″; bound for 2¼″. 11602–14, diameter, ⅜″; bound for ½″. 9540, diameter, 7/16″; bound for ½″.

Specimens of foreshafts from Cave No. 2.—11541–11 (fig. 3, *l*), smoothed hardwood; length, about 6″; diameter, ¼″ to 5/32″; tapers to point which has notch, 3/16″ deep, to hold the stone point; sinew binding and probably glue for point extended back ⅞″; inserted in cane shaft, which is 5/16″ diameter and bound for ⅝″ with sinew. 11541–3, peeled twig; length, 6⅜″; diameter butt, ¼″; butt broken and sinew-wrapped for ½″; point diameter, 3/16″; point is notched. 11541–7, peeled twig; length, 7⅜″; diameter broken butt, ¼″; diameter pointed end, 3/16″. 11541–2, smoothed hardwood; length, 7¼″; diameter, 5/16″; one end broken; other end has rounded point. 11541–8, smoothed hardwood; length, 4½″; diameter at rounded end, 3/16″; at broken end, ⅛″.

Specimens of foreshafts from Cave No. 3.—11550–9, smoothed hardwood; length, 8¼″; diameter, 5/16″; one end rounded; other broken.

Specimens of arrow points from Cave No. 1.—Side-notched triangular, of obsidian: 11563–3 (fig. 4, *j*), 10338 (fig. 4, *c*), 9567 (fig. 4, *d*), 9568, 11563–6 (fig. 4, *e*). These range in length from ½″ to 1″. Several points are basically triangular, the notches being chipped from the lower corners, and are of obsidian: 11563–2 (fig. 4, *a*), 11563–4 (fig. 4, *k*), 11563–5 (fig. 4, *b*), 11563–1 (fig. 5, *o*). These range in length from ⅝″ (11563–4) to 1⅜″ (11563–1). 10284 (fig. 4, *q*) is crudely chipped gray flint, 1⅛″ long, and has a square, unnotched base.

Specimens of arrow points from Cave No. 2.—These are described on page 93, under "Stratification of Cave No. 2."

Specimens of arrow points from other locations.—Several points of the side-notched type were found associated with Shoshonean pottery like that of Cave No. 1 in Cave No. 7 near Connor's Springs; 10835 (fig. 4, *g*), of brown flint; figure 4, *h*, of white flint; figure 4, *i*, of obsidian; figure 4, *m*, of white flint; figure 4, *n*, of obsidian. These range in length from ¾″ (fig. 4, *n*) to 1¼″ (fig. 4, *h*). 11520 (fig. 4, *l*), a side-notched point ¾″ long, and figure 4, *f*, a plain, unnotched point 1⅛″ long, are from Cave No. 11 in the hills just east of Blue Creek. Both are obsidian. 10872 (fig. 4, *p*), from Cave No. 4, is the finest example of the side-notched point. It is of beautifully worked obsidian, 1⅝″ long, ⅛″ thick. Associated artifacts place it in the

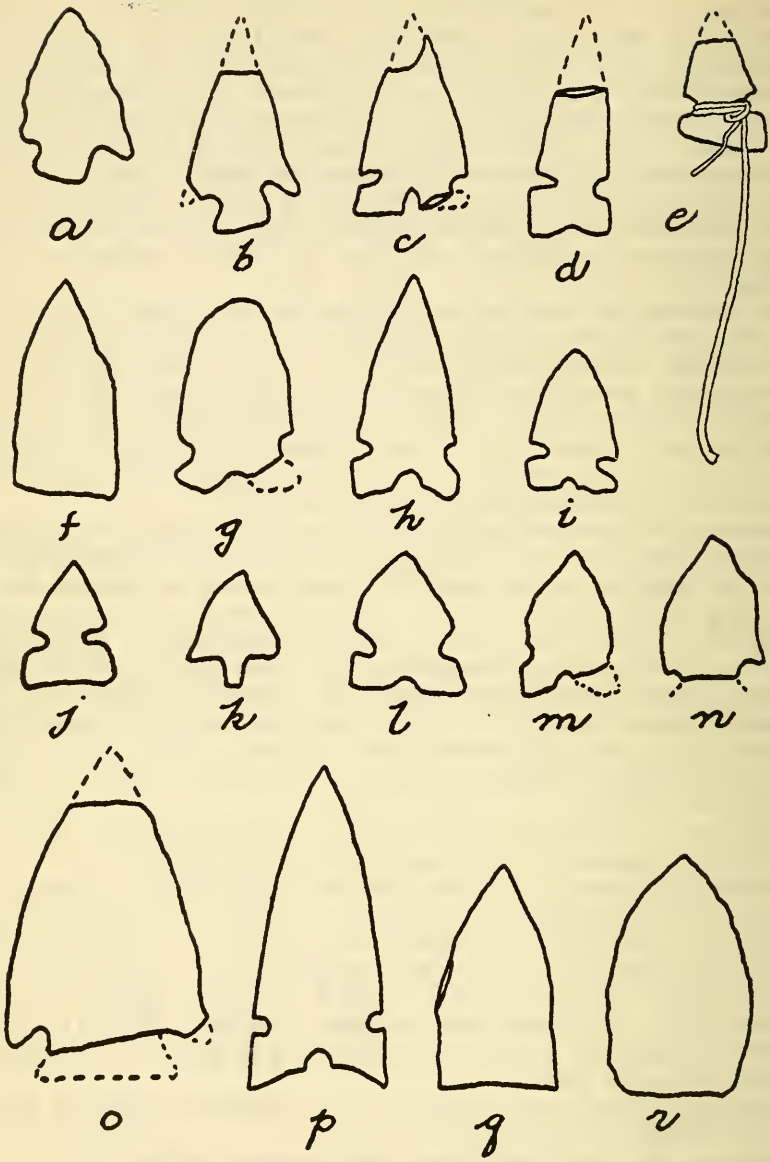


FIGURE 4.—Arrow points of the Promontory culture.

pottery culture as represented in Cave No. 1. 11516 (fig. 4, *r*), from Cave No. 6, is of white flint and has a square, unnotched base.

Cane sections from Cave No. 1.—Many sections of cane of varying lengths are cut squarely at each end and are wrapped in some manner with sinew. It is likely that they were cut from arrows, although it is conceivable that some were used in games. 10441, diameter, 7/32″; length, 7½″; sinew wrapping resembles that at feather end of arrow. 10419, diameter, ⅜″; length, 2½″; no sinew. 9718, diameter, 5/16″; length, 1⅝″; hollow end sinew wrapped for ⅜″ beyond which is ½″ with traces of paint; perhaps is socket for foreshaft.

10456, diameter, 3/8″; length, 1¼″; sinew wrapped for ½″; perhaps socket end of arrow. 9707, diameter, 5/16″; length, 5⅛″; sinew wrapped like feathered end of arrow. 10627, plain section, 1⅜″ long. 10623–6, length, 2⅝″; sinew wrapped in center. 11602–2, diameter, 3/8″; length, 5¾″; no sinew. 11602–15, plain section, 3⅜″ long. 11602–32, diameter, 7/16″; length, 1⅛″; end sinew wrapped for ½″; perhaps from foreshaft socket of arrow. 11602–37, diameter, 3/8″; length, ¼″; end sinew-wrapped for ½″; perhaps foreshaft socket.

Specimens from Cave No. 2.—11541–1, diameter, 3/8″; length, 7″; no sinew.

Specimens from Cave No. 3.—11552–1, diameter, 5/16″; length, 7/8″; end sinew-wrapped for 3/8″. 11550–3, length, 3¼″; sinew-wrapped for 3/8″, ¾″ from end. The following are sections of cane without sinew: 11552–2, diameter, 7/16″; length, 2⅛″; hollow. 11552–3, diameter, 7/16″; length, 2¼″; not hollow. 11552–4, diameter, 3/8″; length, 4⅜″; not hollow. 11552–5, diameter, 3/8″; length, 3¾″; hollow. 11552–6, diameter, 3/8″; length, 2¼″. 11550–13, diameter, 5/16″; length, 1⅝″.

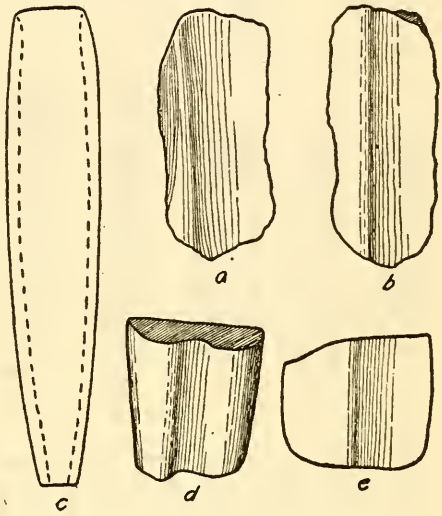


FIGURE 5.—Arrow smoothers and pipe.

ARROW SMOOTHERS

Arrow smoothers are small elongated slabs of rough rock which have grooves running lengthwise on them. 11562–2 (fig. 5, *a*, *b*) is of a rough volcanic rock, 2⅛″ long, 1″ wide, ½″ thick, and has grooves ⅛″ deep on opposite faces. 11562–1 (fig. 5, *e*) is of rough sandstone, 7/16″ thick, and has a groove 3/16″ deep on one face. This specimen was roughly shaped and seems to have been broken across the middle. 9570 (fig. 5, *d*) is of rough sandstone, ¾″ thick, and has a groove ⅛″ deep on one face. All are from Cave No. 1.

Bows

Several fragments of bows were recovered from Cave No. 1. Of these, the most interesting is figure 6, *a*, the end of a sinew-back bow. The wood, shown uppermost in figure 6, *a*, appears to be juniper. It is 2½″ long, 5/16″ thick, and ¾″ wide, tapering to ½″ at the end. Heavy sinew of the same width and ¼″ thick is fastened to the back of the wood, a thin band of sinew being wrapped around both to make it more secure. The bow is notched for the string ½″ from the end.

10768 (fig. 6, *e*) is probably the end of a bow of hardwood. The fragment is 4½″ long, ¼″ thick, and 7/8″ wide, tapering to ½″ at the end, which is charred. Scratches across the face seem to have

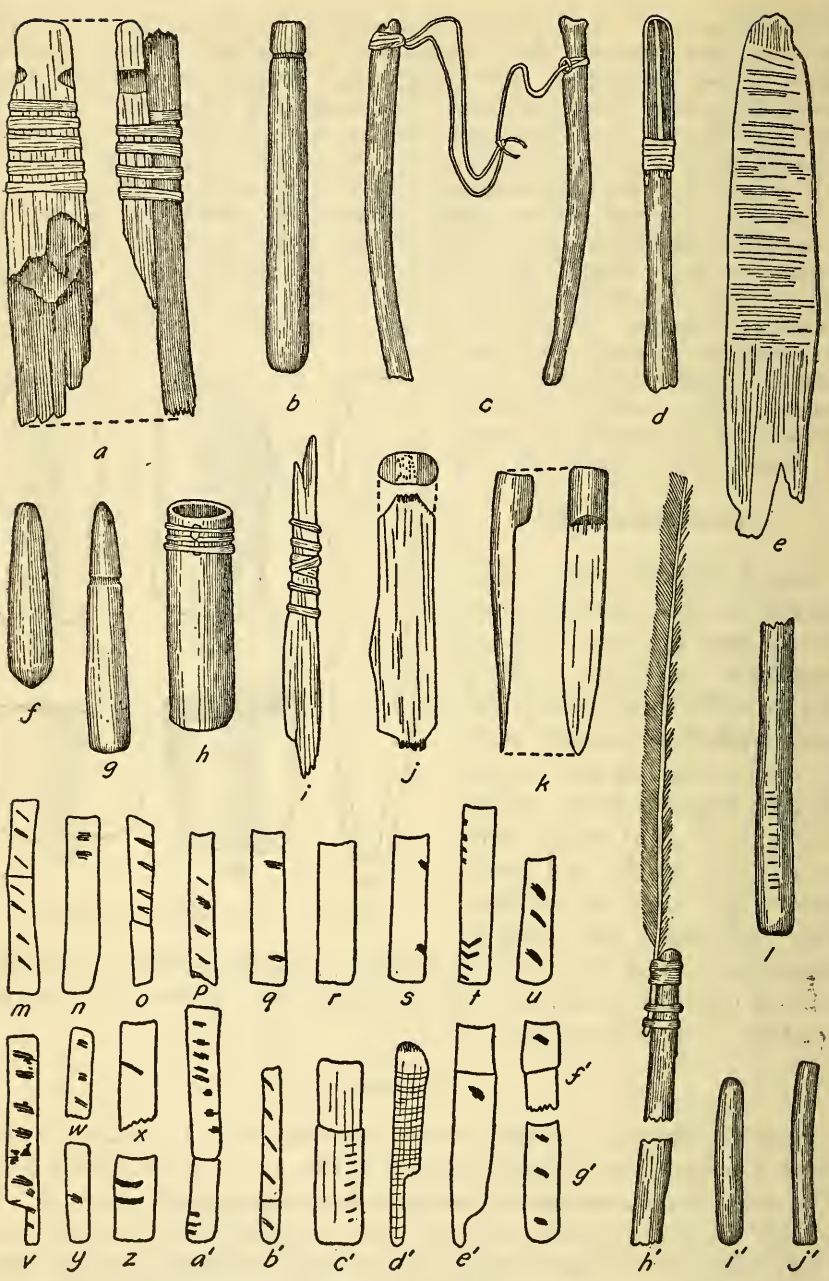


FIGURE 6.—Miscellaneous objects of wood and a bone bead.

been made by cutting with a flint knife, probably part of the shaping process.

11602–2 is a bow fragment 7¾″ long. It is 5/16″ thick in the center, 1/8″ thick at the edges, which are somewhat squared, and 1¼″ wide at the larger end, where it is broken, 5/8″ wide at the small end, which is

broken and charred. There is a cut across one face of the bow 1½″ from the large end, where it is broken. One face is smoothed and polished; the other bears cross scratches from trimming with a stone knife.

10763 is a piece of juniper (?) which may be a bow fragment, although each end is cut off square. It is 4⅛″ long, 1⅛″ wide, and ¼″ thick. One side is smoothed; the other bears cross scratches from cutting.

These do not correspond with the bows from Lovelock Cave, which are described as slender, like those of the modern Paiute.[9]

Miscellaneous Objects of Wood

Fire drills.—A complete fire drill, 10757, from Cave No. 1, is shown in figure 3, *a*. The total length, including foreshaft, is 21″. The main shaft is hardwood, 7/16″ diameter, and is decorated with a groove running lengthwise down one side to within 2″ of the butt. This groove is bordered with groups of three small incisions, each group spaced 1½″ apart, and on alternate sides. The lower end is bound with sinew for ⅞″. The foreshaft is 1⅜″ long and ¼″ in diameter where it is inserted into the main shaft, but broadens out to ⅜″ diameter. The tip of the foreshaft is blunt and charred from use in making fire.

A number of other specimens from Cave No. 1 may have been used as, or prepared for use as, fire-drill foreshafts. 10374 (fig. 6, *b*) is of hardwood, 3/16″ long, ⅜″ in diameter, tapering to 5/16″ at the butt, which is broken. It is encircled by a groove ¼″ from the butt. The tip is somewhat rounded and charred. 10461 (fig. 6, *g*) is of hardwood, 2¼″ long. One end is blunt like 10757, though not charred; the other end tapers to a point and is encircled ¾″ from the point by a groove. 11602–22 is of some species of willow (*Salix*), 2⅝″ long, 5/16″ in diameter. One end is blunt like 10757; the other end is broken. From ⅜″ to 1¼″ from the blunt end are 12 short incisions across the shaft. 10373 is of hardwood, 7½″ long, 5/16″ in diameter, having each end cut and somewhat rounded. One end slightly tapers and has a burned tip, suggesting use as a fire drill. The specimen is covered with red paint. 9694 is of smoothed hardwood, 9¼″ long, 5/16″ in diameter. One end is broken and burned; the other is slightly larger and rounded. 10621, of elderberry (*Sambucus*), may once have been the lower end of a fire-drill shaft with the socket for the foreshaft, but was cut later. It is 2⅞″ long, 5/16″ in diameter. One end is cut off square and wrapped with sinew for 1″; the other end has a socket, 3/16″ in diameter, running back into it

[9] Loud and Harrington, 1929, p. 117.

¾″. 11602–31, of willow (*Salix*), may have been a fire-drill foreshaft. It is a shaft of smoothed hardwood, 2″ long, 5/16″ in diameter, having a rounded point at one end, and having been broken at the other end after first being notched from each side.

11089 (fig. 6, *f*) is from Cave No. 2, between 2′ and 2′ 6″ deep. It is of rather weathered hardwood, 1⅝″ long, and tapers from ⅜″ in diameter at the tip to 3/16″ at the butt. The tip appears to be charred and is the shape of a fire drill.

Digging sticks.—These are generally about 2 feet long, of greasewood (*Sarcobatus vermiculatus*), hackberry (*Celtis reticulata*?), or willow (*Salix*), which has been stripped of bark and polished but not trimmed except for the shaping of the point. In most specimens the point is charred, probably to lend additional hardness, and the handle end merely rounded.

Specimens of digging sticks from Cave No. 1.—11530, greasewood; length, 23½″; diameter, ¾″; bark not removed but end somewhat sharpened and worn; other end burned. 9675, fragment of a large stick with a smoothed end, probably a digging stick. 9692, charred point; greasewood; diameter, ¾″; length, 8½″. 10280, point of greasewood; diameter, ½″. 10760, charred point of greasewood; other end broken; length, 12″; diameter, 7/16″. 10295, crude greasewood digging stick(?); length, 11¼″; diameter, ½″; butt and point charred.

Specimens of digging sticks from Cave No. 2.—10471, polished hackberry; length, 16¼″; diameter, ⅝″ to ¾″; point worn; butt shows marks of cutting with stone knife but is polished from use. 11538–2, peeled willow; length, 13½″; diameter, ½″. 11538–1, possibly digging stick; peeled willow; length, 11¼″; diameter, 11/16″; both ends rounded, worn, and somewhat charred.

Specimens of digging sticks from Cave No. 3.—11549–1, greasewood; length, 17″; diameter, ⅝″; both ends charred; one end more or less pointed and worn after charring. 11549–2, like last; length, 13″; diameter, ¾″. 11549–3, like last; length, 20¾″; diameter ½″.

Objects of juniper bark.—Cave No. 1 yielded a number of small rings of juniper bark from *Juniperus utahensis* (pl. 6, *f*) which closely resemble the rings commonly used throughout puebloan cultures of the Southwest as pot rests. They vary from 2½″ to 4¼″ in outside diameter, and are bound generally with juniper bark but occasionally with cord.

Cedar bark rings

Cat. No.	Outside diameter	Inside diameter	Binding	Cat. No.	Outside diameter	Inside diameter	Binding
	In.	*In.*			*In.*	*In.*	
10391	4¼	3	Cedar bark.		3	1	Cedar bark.
9631	2½	1½	Do.		3¼	1¾	Do.
10570	2¼	0	2-ply cord.	10332	2½	1¼	Do.
9685	4	2½	Cedar bark.	10547	4	1¾	Do.
9707	3½	1⅞	Do.	9666	3	1½	Do.[1]

[1] Bundle forming ring is twisted.

9548 is a hank of juniper bark, 9″ long, tied in the middle with juniper bark. 10388 is a small bundle of juniper bark. 11542 (fig. 15, *h*), from Cave No. 3, is a ball of juniper bark 1¼″ in diameter.

MISCELLANEOUS SHAFTS OF WOOD.—Many cylinders or sections of hardwood of varying lengths and diameters were found. Some seem to have been parts of arrow or fire-drill shafts; others are of unknown use.

Specimens from Cave No. 1.—9679, polished shaft; diameter, ¾″; length, 2⅞″; somewhat broken; each end cut. 10557, peeled twig; diameter, 5/16″; length, 6¼″; one end rounded, other burned. 10281, polished stick; diameter, ¼″; length, 6⅝″; one end rounded, other broken; slight groove 2¾″ from rounded end. 9578, plain hardwood; diameter, ¼″; length, 6″; each end cut. 10453, plain hardwood; diameter, 7/16″; length, 7½″; each end cut. 9577, plain hardwood; diameter, ¼″; length, 3⅛″; each end cut. 10427, smoothed hardwood; diameter, ⅜″; length, 3½″; ends cut square; partially cut ⅞″ from one end. 10619, smoothed shaft; diameter, ¼″; length, 8⅝″; ends cut. 10612, smoothed; diameter, ¼″; length, 6″; one end cut and slightly worn; other broken. 10620, smoothed; diameter, ¼″; length, 6½″; one end cut square and slightly worn; other broken. 10618, smoothed; diameter, ¼″; length, 3⅜″; one end cut square, other worn round. 10615, small peg; diameter, 5/16″; length, 1⅝″; one end whittled to dull point. 9601, plain twig; diameter, ¼″; length, 5⅞″; one end rounded, other broken. 10426, plain, smoothed (fig. 6, *i′*); diameter, 5/16″; length 1½″; each end somewhat rounded; possibly gaming piece. 10407, smoothed shaft; diameter, ¼″; length, 2⅝″; ends trimmed and smoothed more or less square. 9693. smoothed shaft; diameter, 5/16″; length, 6¾″; one end cut square, other broken; 1¾″ from square end are 11 notches across shaft, each 3/16″ long and spaced 3/16″ to ¼″ apart. 11602–24, smoothed rabbit-brush shaft; diameter, 5/16″; length, 4¾″; cut each end. 11602–10, smoothed rabbit-brush shaft; diameter, ⅝″; length, 10½″; cut each end. 11602–39, smoothed shaft; diameter, 5/16″; length, 12⅝″; cut each end; one end sinew-wrapped for ¼″. 11602–6, smoothed rabbit-brush shaft; diameter, 5/16″; length, 10⅛″; one end blunt point, other broken. 11602–29, smoothed shaft; diameter, ¼″; length, 3⅝″; one end blunt point, other burned. 11602–26, smoothed shaft; diameter, 5/16″; length, 4″; cut each end. 11610–1, smoothed cottonwood(?) shaft; diameter, 7/16″; length, 7¾″; both ends rounded and charred.

Specimens from Cave No. 2.—10499, greasewood stick with bark peeled; diameter, ¼″; length, 12⅜″; each end charred. 11539, willow (*Salix exigua?*) twig with bark remaining; diameter, ⅜″; length, 14½″; one end cut square, other end cut at angle. 10498, smoothed greasewood shaft; diameter, 5/16″; length, 12″; one end broken, other cut square and slightly tapered. 10208, fragment of smoothed twig; diameter, 3/16″; length, 3¾″; ends broken. 10205, twig with bark remaining; diameter, 3/16″; length, 7½″; one end has long tapering point. 10210, twig with bark remaining; diameter, ¼″; length, 2½″; ends broken, sinew wrapping in center. 10211, smoothed shaft; diameter, 5/16″; length, 3¼″; one end cut, other broken. 10212, smoothed shaft; diameter, ¼″; length, 1⅛″; both ends cut. 10206, smoothed shaft; diameter, ¼″; length, 4⅛″; both ends cut. 10207, twig; diameter, ¼″; length, 4¼″; ends somewhat sharpened and worn. 11090, diameter, ⅜″; length, ¾″; cut each end.

Specimens from Cave No. 3.—11550–14, smoothed shaft; diameter, 3/16″ length, 1¼″; each end cut. 11550–16, plain shaft; diameter, 3/8″; length, 1½″. 11550–8, plain shaft; diameter, ¼″; length, 4½″; both ends broken; one end sinew-wrapped for 1¼″; may be foreshaft of drill or arrow. 11550–12, plain shaft; diameter, 5/16″; length, 5¾″; each end rounded.

Wooden tubes.—Cave No. 1 yielded several specimens of well-trimmed wooden tubes which were made by hollowing a very pithy wood, probably elderberry (*Sambucus glauca*). These are about ¾″ in diameter and vary from 1⅞″ to 10½″ in length. Two have sinew wrapping near one end. None give any clear evidence as to their use. The only similar objects in modern ethnological collections are wooden and cane tubes used in the Southwest for the hidden-ball game.[10]

Specimens from Cave No. 1.—10626, hollowed elderberry stick; length, 3¾″; now crushed but diameter was approximately 5/8″ to ¾″; starting 3/16″ from one end, sinew wrapping extends for 5/16″; well trimmed and smoothed; wall thickness, 1/8″. 11612, hollowed elderberry stick, pith removed; knots remain on outside; bark removed; length, 10½″; diameter one end, 5/8″; other end, ¾″; wall thickness, 1/8″; evidently is incomplete; no evidence of being intended as flute or whistle. 10423, plain tube of hollowed stick (fig. 6, *h*); length, 1⅞″; diameter, 9/16″; wall thickness, 1/16″; sinew wrapped at one end; well trimmed and smoothed; bark removed.

Specimen from Cave No. 2.—10487, hollowed and split lengthwise; diameter, 9/16″; wall thickness, 5/32″; one end has bark removed for ½″; other end charred for 3″.

Sinew-wrapped splinters of wood.—A number of rough splinters are wrapped, usually at one end, with a small amount of sinew. Although these resemble somewhat the feathered darts mentioned below, there is no evidence that feathers were ever affixed to them. No other use can be assigned to them.

Specimens from Cave No. 1.—9598, length, 1¾″; entire length sinew-wrapped. 11611–1, length, 2¾″; sinew-wrapped for ¾″ in middle. 10445, crude twig; length, 9¼″; somewhat bent; sinew-wrapped for 2⅜″ in middle. 10566, very crude bent twig; length, 8″; sinew-wrapped more or less entire length. 10420 (fig. 6, *i*), length, 3½″; sinew-wrapped for ¾″ near one end. 10367, length, 4⅝″; sinew-wrapped at one end. 10378, length, 3¼″; sinew-wrapped from one end to middle. 10510 (from 2′ deep), twig fragment; diameter 3/16″; fragments of sinew wrapping.

Miscellaneous objects of wood.—The following are various objects of shaped wood, the use of which is not known.

Specimens from Cave No. 1.—10392, somewhat trimmed splinter of hardwood; 7⅛″ long, ¾″ wide, 1/8″ thick; burned to a point. 10454, hardwood; 5¼″ long; approximately ¼″ square with worn edges; broken at one end, worn at the other. 10418, irregular hardwood stick, 3⅛″ long, ½″ diameter; roughly worked to a point at each end. 9695, willow stick, split in two lengthwise with its edges rounded; it is 7″ long, 9/16″ in diameter; one end is rounded, the other

[10] Culin, 1907, pp. 352–357, 367–373.

roken; possibly gaming piece. 9707, hardwood stick; 5¾″ long, ½″ wide; lightly bent, with broken ends; drilled in the center with a hole ⅛″ in iameter and has a similar hole at the broken end. 10399, split twig; 5/16″ wide, /16″ thick; curved to form a circle 3¼″ in diameter; the ends had probably een tied with sinew. 10523, fragment of hardwood; ¾″ in diameter, 1½″ ong; cut square at each end and split lengthwise so that only one half re- ains. 10287, fragment of juniper, possibly from a bow; 5¼″ long, ½″ ide, ¼″ thick; one end rounded, the other cut and broken; originally it nust have had twice the present width. 10282, smoothed, somewhat crooked wig, 5/16″ diameter, 7⅜″ long; somewhat charred. 10447, rough twig; ⅜″ iameter, 7¾″ long; bears transverse knife cuts. 10462, bent, peeled twig; ¼″ diameter, 4¾″ long; one end rounded, the other broken; sinew-wrapped or ¾″ in the middle. 10613, smoothed, plain rabbit-brush stick; 9¼″ long, ¼″ diameter; one end tapers to a long, blunt point; other end broken. 10622, ragment much like 10287; perhaps a bow. 10630, smoothed, knotty grease- wood stick, ½″ diameter, 7¼″ long, worn to a point at each end. 10614, crude tick of juniper (*Juniperus utahensis*); ⅝″ diameter, 4⅜″ long; broken ends; wrapped in the center with wide sinew.

Specimens of special interest are: 11600–2 (fig. 6, *k*), a peg of hardwood, ½″ long, ⅜″ diameter, cut square at one end, the other end split away and rimmed for 2″ to form a slender point. 11602–35, two twigs (fig. 6, *c*), each bout 3″ long, ¼″ diameter, tied together at their ends with a sinew 4¼″ ong. These and the pegs may be parts of snares.[11] 11550–6 (fig. 6, *d*), a lain hardwood stick, 5/16″ diameter, 4″ long, having two thin strips of split ane crossed over one end of the stick and brought down its sides where they re bound with sinew 1″ from the end.

Specimens from Cave No. 2.—10209 is a fragment of cedar, 3⅜″ long with the nds cut square, ⅝″ wide, 5/16″ thick. It is flat and smoothed. 11537 is a moothed piece of hardwood, 3¾″ long and more or less rounded, being ½″ y ⅝″ in diameter, with ends rounded and smoothed.

Pieces of cut wood.—A number of specimens are of interest in demonstrating the manner in which wood was cut. Round sticks were encircled by grooves which were made as deep as necessary and were then broken. Flat sticks were generally deeply notched from opposite sides and then broken.

Specimens from Cave No. 1.—9696 is a large splinter of hardwood, ¾″ wide y ½″ thick. A groove ¼″ deep had been made on each side 1½″ from end, nd splinters removed, leaving the end ¼″ wide, where it had been grooved gain and broken. 10634, hardwood twig; diameter, ¼″; length, 2⅝″; grooves cut on opposite sides of end, each 1/16″ deep, 5/16″ long, for breaking. 10321, hardwood stick (fig. 6, *j*); length, 2⅛″; width, 9/16″; thickness, 5/16″; each end had been cut with grooves ⅜″ wide, ⅛″ to 3/16″ deep on opposite sides, then broken. 11610–2, of maple (*Acer grandidentatum*), had been cut in a similar manner.

Games

Cane gambling pieces.—Cave No. 1 yielded 24 small fragments of cane (fig. 6, *m–g'*), most of which are cut square at each end, and which range from ¾″ to 2⅜″ in length and average approximately

[11] Compare Loud and Harrington, 1929, p. 115, pl. 48, *a*, *b*, and Schellbach, 1927.

5/16″ wide. These are decorated with small transverse grooves. Four specimens have 1 groove each, 6 have 2, 4 have 3, 1 has 4, 1 has 5, 1 has 6, 2 have 7, 2 have 8, 1 has 11. These may have been either dice or game counters.[12]

Specimens from Cave No. 1.—9599, 9600, 9678, 10337, 10272, 10386, 10440 (17 specimens), 11571.

HOOP-AND-DART GAME.—A netted hoop and a number of small feathered darts were probably used in a game. The hoop, 10360 (pl. 6, *k*; fig. 7), is formed by a twig 1/4″ in diameter, with the bark left on, bent into a circle 6″ in diameter, its trimmed ends being bound together with sinew. The netting was formed by lacing sinew in an apparently irregular manner. The darts are generally crude splinters or twigs (pl. 6, *l*; fig. 6, *h*), about 4″ in length, to the ends of which trimmed feathers of equal length are bound with sinew.

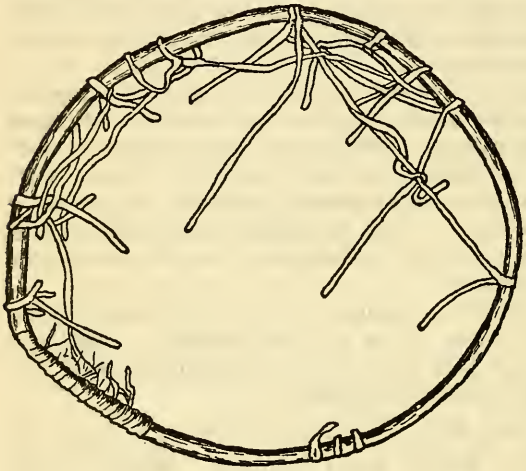


FIGURE 7.—Netted hoop.

A game employing similar implements was recorded among the Nevada and Utah Shoshoni. One player casts a small feathered dart which is caught in a small netted ring held by a second player. Culin records specimens very like these from the Plains[13] and a Southern Paiute hoop and dart from southern Utah[14] are almost identical with these.

Specimens of darts from Cave No. 1.—Figure 6, *h′*, crude twig; length, 4 1/4″; end charred before feather was lashed on; feather length, 4 1/4″; feather width, 1/2″. 11602–25, smoothed wooden shaft, 8″ long, 5/16″ diameter; end broken; fragment of large (turkey buzzard?) feather remains; feather tied for 1 1/4″ with sinew. 11609, crude knotty twig with bark peeled; length, 7 1/2″; diameter, 3/8″; fragment of large feather like 11602–25 lashed to end. 11602–37, crude splinter; length, 3 3/8″; diameter, 3/16″; fragment of large white (great horned owl?) feather, 1 3/4″ long, is lashed to end of stick for 1/2″ with sinew. 11602–34, crude greasewood twig with bark peeled off; length, 5 1/2″; diameter, 5/16″; black feather lashed to twig end with 1 1/2″ of sinew. 10515, crude twig; length, 2 3/4″; diameter, 3/16″; feather, probably turkey buzzard, somewhat broken; length, 3 3/4″; lashed to twig for 3/4″ with sinew. 10514, plain twig

[12] Compare Culin, 1907, pp. 160–165, 167, 191, 210–220.
[13] Culin, 1907, pp. 420–526, especially pp. 441–448.
[14] Culin, 1907, p. 498, fig. 653.

with bark remaining; length, 3¾''; diameter, ¼''; one end sharpened; feather, probably turkey buzzard, lashed to other end; feather length beyond twig, 3¾''.

GAMING BONES.—A number of flat pieces of bone with rounded ends, generally cut from the long bones of large mammals (fig. 8,

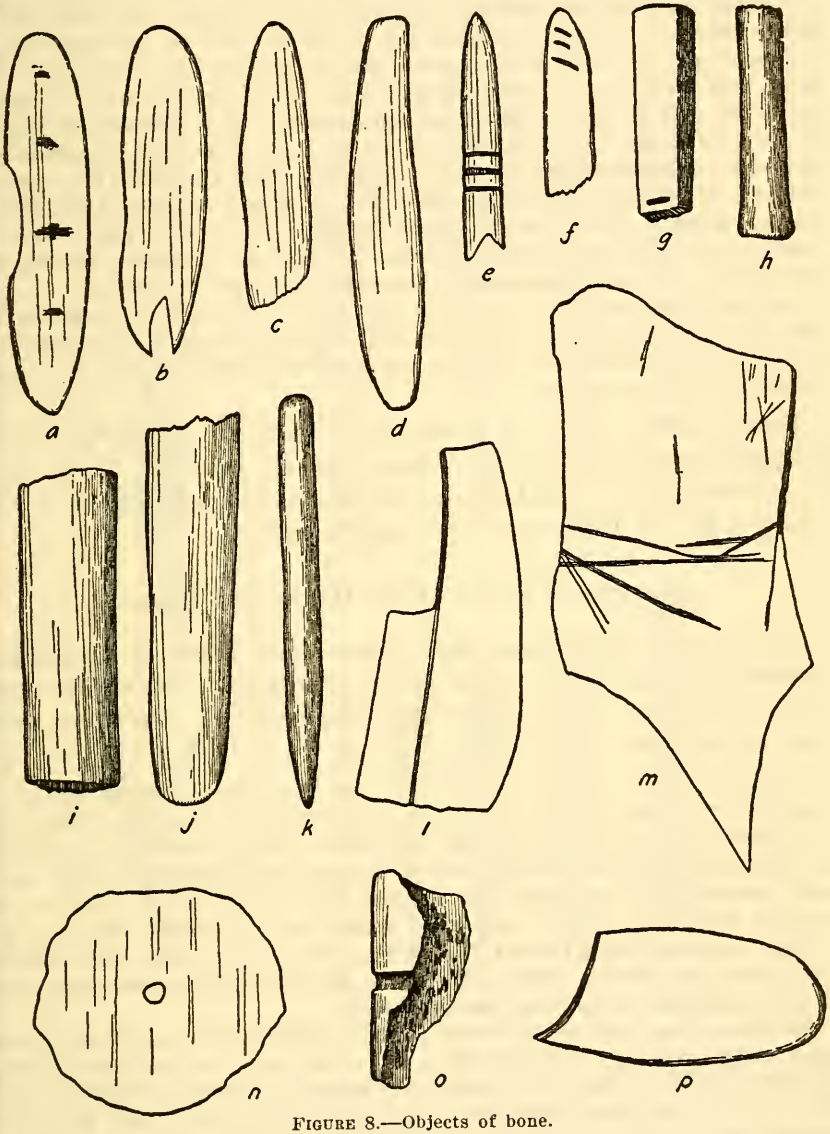


FIGURE 8.—Objects of bone.

a–c), are, with few exceptions, about the size and shape of the bones used in the hand game by modern tribes of the west. Figure 8, *g*, a squarish bone, may also have been used in the hand game, though this style of bone is more common in California. The larger specimens (fig. 8, *a*, *d*), if not used in the hand game, may have been used in some other game.

Specimens from Cave No. 1.—10396 (fig. 8, *a*) is 3⅜″ long, ¾″ wide, ⅛″ thick, but has one side broken. It is well polished and decorated with 4 transverse scratched lines. 10425 (fig. 8, *f*) is 1⅝″ long, 7/16″ wide, 1/16″ thick, rounded at one end and broken at the other. It is highly polished and one end is decorated with 3 diagonal marks. 10430 (fig. 8, *e*) is 2¼″ long, ⅜″ wide, 1/16″ thick, more or less pointed at one end and broken at the other. It is highly polished; the back side bears red paint; the front is decorated with 3 transverse grooves which were probably across the center of the complete artifact. 10435 (fig. 8, *c*) is very irregular, 2½″ long, approximately ⅝″ wide, ⅛″ thick, with one end rounded, the other broken. It is polished but undecorated. 10371 (fig. 8, *b*) is 3″ long, ¾″ wide, 1/16″ thick, polished, rounded at each end but undecorated; one end is somewhat broken. 10590 (fig. 8, *d*) is irregular, 3½″ long, averages ⅝″ wide, 3/32″ thick, and is polished but undecorated. 10410 is like 10590 in general features, but is 4⅛″ long, which is perhaps too great for a hand-game bone; it may be a cutting or scraping instrument. See also "Miscellaneous objects of bone from Cave No. 1".

Specimen from Cave No. 2.—11536–1 (fig. 8, *g*) is cut from the long bone of some small mammal. It is 2″ long and roughly ⅜″ by ½″ in diameter. One end is cut square; the other was notched, then broken irregularly, a notch remaining ⅛″ from the end.

Dice.—11565 (fig. 15, *a*) is described under "Ornaments", for it is wrapped with sinew as if for suspension as a pendant. It is, however, identical in other features with beaver-teeth dice used by the tribes of British Columbia and Puget Sound.[15]

Objects of Bone, Hoof, Horn, and Shell

Bone awls.—Awls were made from long bones of mammals, scapulae, and bird bones. The only generalization that can be made concerning them is that more often than not bone splinters were used or the joint at the end of the bone was cut off.

Specimens from Cave No. 1.—11576–4 (fig 9, *a*), rib of large mammal; length, 6¾″; one end has long, sharp point; other end broken. 10617 (fig. 9, *b*), made from splinter of long bone of large mammal; length, 5½″; polished all over, including butt. 11576–5 (fig. 9, *f*), made from scapula of large mammal; length, 4¼″; smooth and polished all over. 11576–2 (fig. 9, *m*), splinter from long bone of mammal; length, 4⅜″; polished all over, including squarish butt. 11576–1 (fig. 9, *k*), from bone of large bird; length, 3⅜″; butt end broken. 10434 (fig. 9, *h*), probably splinter from long bone of large mammal; burned and butt broken off.

Specimens from Cave No. 2.—10492 (fig. 9, *c*), splinter from leg bone of large mammal; length, 5⅛″; polished all over. 10354 (fig. 9, *d*), leg bone of large mammal (deer?); length, 5″; bone joint remains on butt end but has been partially trimmed down, evidence of the cutting remaining; point is ground smooth, but evidence of cutting also remains near point. 10351 (fig. 9, *j*), from gravel, stratum 2; splinter from mammal leg bone; length, 3″; butt broken; polished except for butt end. 10358 (fig. 9, *i*), splinter from mammal leg bone; length, 2⅞″; somewhat rough except for point. 10220 (fig. 9, *g*), splinter from leg bone of mammal; length, 2¼″; point rather blunt.

[15] Culin, 1907, pp. 155–158, 196–198.

Specimen from Cave No. 5.—11514 (fig. 9, *l*), made from leg bone of mammal, with joint remaining at butt end; length, 3⅞″.

FLAKING TOOLS.—A number of bone implements, shaped like awls but with blunt points, were presumably used for flaking flint.

Specimens from Cave No. 1.—11576–3 (fig. 9, *e*), splinter of leg bone of large mammal; length, 5¼″; point blunt; polished all over. 10520 (fig. 8, *k*),

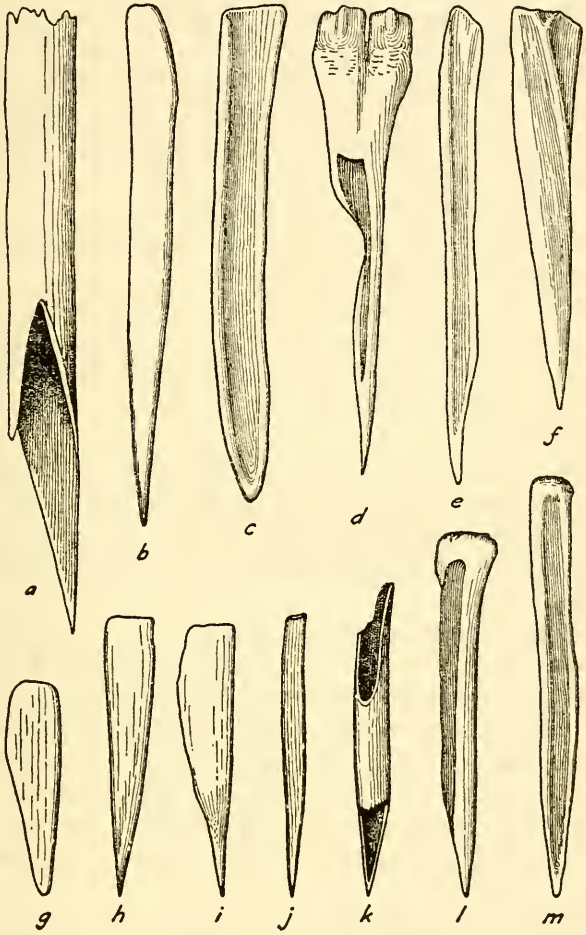


FIGURE 9.—Bone awls and points.

splinter of leg bone of large mammal; length, 3⅝″; more or less squarish, ¼″ square; point is blunt (too blunt for awl); butt is rounded; polished all over and burned. 10291, fragment worked from the leg bone of a large mammal; marks on its blunt point suggest use as a flaking tool. 11579–1, a fragment of a large bone 5⅛″ long; irregularly cut and shows wear over all edges; sharpened to a blunt point.

MISCELLANEOUS OBJECTS OF BONE FROM CAVE NO. 1.—10510 (fig. 8, *h*) is a hollow bone, 2″ long, ⅜″ diameter, having one end cut square

and polished, the other end broken. This resembles bone beads which are common in the Southwest.

10579 (fig. 8, *j*) is a section of rib, probably from a bison, 3⅜″ long, having one end rounded, the other broken.

11536–2 is a fragment of a leg bone of a large mammal, 3⅝″ long, 1⅛″ diameter, having one end broken and the other cut and encircled by a groove ¼″ from the end.

10636, worked from a splinter of the leg bone of a large mammal, resembles the hand-game bones, but is 3⅞″ long, 9/16″ wide, 1/16″ thick. Its edges are trimmed but are irregular and unpolished. 10372 resembles the last, is 3⅜″ long, ¾″ wide, and 3/16″ thick. 10551 resembles the last but is from a rib fragment. It is 4⅜″ long, ⅝″ wide, and has edges which are irregularly cut but show wear. Striations run longitudinally on the smooth side.

9680 is a fragment of a large rib, 3¼″ long, broken at each end but entirely covered with deep red paint.

11534 (fig. 15, *d*) is a fragment of bone which is 1⅞″ long and ⅝″ square. One end is broken, the other cut square. Three edges and one end are cut with small notches as shown in the illustration; the fourth edge has only 2 notches in the middle. This may have been for the hand game.

10473 is cut from the scapula of a large mammal. It is 6″ long, ¾″ wide at the small end, and 2″ wide at the large end. The two long edges are thin and highly polished; all edges show wear, perhaps from scraping. The small end is cut square and is covered with red paint.

11581 is a very irregular, broken fragment of the leg bone of a large mammal. It is 5″ long but is worked only for 1″ along the edge at one end. It is stained all over with red paint.

Miscellaneous objects of bone from Cave No. 2.—11154 (fig. 8, *i*) is a hollow section of the leg bone of a large mammal, 2¾″ long, cut squarely at one end by first cutting a groove, then breaking. 10214 (fig. 8, *o*) is a deeply grooved fragment of the leg bone of a large mammal. This groove was probably made in preparation for breaking.

Objects cut from scapulae from Cave No. 1.—10572 (fig. 8, *n*) is a disc, roughly 2″ diameter, ⅛″ thick, drilled with a 3/16″ hole in the center. It is probably a necklace or neck ornament. (Compare with the pottery discs, fig. 15, *i*, *j*, *k*.)

10417 is a small, irregular piece of scapula, 1/16″ to ⅛″ thick, having one polished edge, and covered on one side with red paint.

11578–16 is a fragment having several deep grooves on one side, probably made preparatory to breaking.

11578–20 is a small fragment like 10417, but lacks red paint. 10748 (fig. 8, *p*) is similar, but more complete, being oval in shape and 2½″ long.

Objects cut from scapulae from Cave No. 2.—10221 (fig. 8, *m*) is a large fragment having several deep scratches and grooves. The bone is broken along one of these, suggesting that this method was employed in breaking bones to the desired shapes.

Objects of hoof from Cave No. 1.—10299 (fig. 8, *l*) is the outer covering of a buffalo hoof, 3¼″ long. One edge is smoothed; the other had been broken by first cutting a deep groove, part of which remains. 11598–1, antelope foot with one hoof and skin attached. 11598–2, skin of antelope leg with both hoofs attached. 9553, 2 bison hoofs.

10217 from Cave No. 2 is a fragment of buffalo hoof which has been cut and flattened out.

Objects of horn and antler from Cave No. 1.—These are surprisingly rare in view of the large number of buffalo, antelope, and deer remains in the caves. 11574–3 is half of the tip of an unworked bison horn which had been split lengthwise. 11574–2 is a similar fragment of antelope horn. 10293 is a fragment of a buffalo horn, split lengthwise and somewhat trimmed so as to leave a small nob at the tip. Except for the butt end, the edges show some wear. 9478 is an antelope horn having two deep notches on one side near the tip. 11574–1 and 11574–4 are tips of antelope horns which are unworked.

Objects of shell.—As the Great Salt Lake region naturally affords few shells, their occurrence in sites and use is very restricted. The Promontory caves yield merely unworked fragments, probably of *Margaritana margaritifera* Linn. These are: 11561–1, 11561–2, 10428 (3 fragments), and 9574 from Cave No. 1, and 10223 from Cave No. 2. Other fragments of the same shell occur in lower levels of Cave No. 2. (See p. 101. See also "Ornaments.")

Textiles and Weaving

Matting.—The Promontory caves yielded 41 specimens of matting. Materials used include: for the warp, usually tule or rush (*Scirpus americanus*), but occasionally reed (*Phragmites communis* Trin.), squaw bush (*Rhus trilobata*), or willow (*Salix*); and for the twined weft, usually 1-ply juniper bark cord (*Juniperus utahensis*), but occasionally 1-ply tule or fine bark cord. The usual weave consists of a warp of one to several tules or bundles of juniper bark laid parallel, 2 to 6 per inch, and twined together at intervals of ½″ to 2½″ with pairs of cords. Only 10394 and 10322, small fragments, have the adjoining warp elements sewed together by passing a cord through them.

Occasionally ornamental braided strands of tule are added to the weft. The greatest variation is exhibited in the manner of finishing the edges.

Specimens of mat weaving from Cave No. 1.—9597 (pl. 6, *a*; fig. 11, *c*) is a complete specimen of mat, neatly and firmly woven, 15½" long, 8" wide at the lower end, and 6" wide at the upper end. The warp is tule, which is folded over at the end and brought back on itself so as to make each element double. These are laid 4½ per inch and are twined together at intervals of approximately 1½" by 1-ply juniper bark cord, ⅛" in diameter. The edges of the mat are bordered with twisted tule.

9544 is a fragment of an incomplete specimen which is woven like 9597 but is larger. This has 4 to 5 tule warp strands per inch. One edge is repaired with added tule stems, fastened by strips 3/16" wide, of material, perhaps willow, like that used in coiled basketry.

9636 has 3 tule warp elements per inch, twined at intervals of 2" with small 1-ply cord. 9656, a fragment, is like 9636, but is twined at intervals of 1¼". 10412, a fragment, has 3 tule warps per inch, twined at intervals of 1¾" to 2¼" with 1-ply juniper bark cord 1/16" in diameter. 10415, 2 fragments, have 3 doubled tule warps per inch, twined at intervals of 1¼" to 1½" with tule of the same size. 10409, a fragment, has a doubled tule warp, twined every ¾" to ⅞" with 1-ply juniper cord, ⅛" in diameter. 9671, a fragment, has 6 tule warp elements per inch, twined at intervals of 1" with 1-ply tule cord, ⅛" in diameter. 9646, a small fragment, has a tule bundle warp, 2 per inch, twined together at intervals of 2½" with tule which is ⅜" to ½" in diameter. 10459, a fragment, has a doubled tule warp, 3 to 4 per inch, twined together at intervals of ⅞" by a 1-ply cord 1/16" in diameter. 10331, from 2' deep, has 5 tule warp strands per inch and is twined at intervals of 1".

9520, a fragment, has a juniper bark warp, 3 per inch, twined at intervals of ½" to ¾" with 1-ply juniper bark cord. 10553, a fragment, has a juniper bark warp, 5 per inch, twined at intervals of 1¼" with 1-ply juniper bark cord ⅛" in diameter.

11603–2, a fragment, has 5 tule warps per inch, each doubled back on itself at the edge, where it is twined with bark cord.

9683, a fragment, shows a common method of handling the twining elements. The warp is a bundle of 6 to 8 tules, one bundle every ¾". These are twined at intervals of 5" to 7" by two large bundles of loosely twisted tules, which run across the mat, then down the edge to run back across it.

9682 is a fragment resembling 9597 and is 16" wide, 15" long. It has 4½ tule warp elements per inch and is twined every ¾" to 1". A wide buckskin thong, the function of which is not clear, is woven into the mat near each edge. On one side the ends of the thong are tied in a complicated knot.

9660 (fig. 10, *c*) is a fragment woven in simple checkerboard style of flat bundles of juniper bark, 2 per inch.

11603–5 (fig. 10, *h*) is a variety of diagonal open twine. It has two double tule warps per inch which are twined at intervals of 1½" to 1¾" with a pair of tules.

Mat edges from Cave No. 1.—10474 (fig. 10, *b*) is one of the simplest edges. The tule warp is doubled over to be included by the pair of weft cords with the adjoining warp. 10764, a large fragment, probably of a tray 12" to 15" in diameter, has a warp of doubled tules, 3½ per inch, which are twined at intervals of 1⅛" to 1¼" with a pair of 1-ply juniper bark cords which are ⅛" in diameter. The edge is finished like 10474. 11604–1, a fragment, has its edge finished in a similar manner.

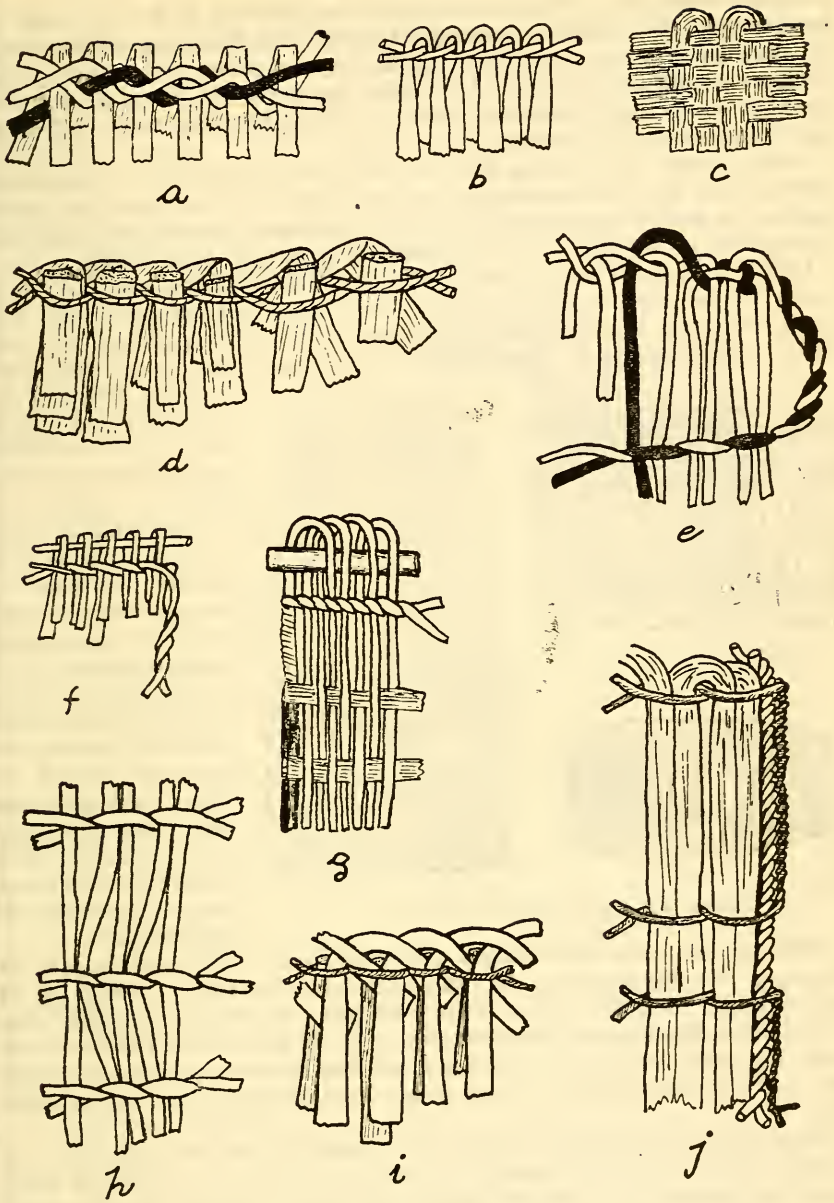


FIGURE 10.—Mat edges.

9520 (fig. 10, *i*) is a more common method of finishing the edge. Each warp is made up of two tule stems. One is cut off square just above the juniper cord twining; the other is bent over to the right in front of the cognate strand of the next warp and its end is stuck down through the twining of the next warp and between its two elements. This specimen has 4½ warp elements per inch and is twined with a pair of 1-ply juniper bark cords at intervals of ¾". 9594 (fig. 10, *d*) shows the other side of the same type of edge finish. 116034, a fragment, has a warp made up of bundles of 2 or 3 tules, 3 warps per inch, and

is twined with juniper bark cord at intervals of 1¼″ to 2″. Its edge is finished like 9520. 10761, a fragment of a mat edge finished like 9520, has 4 tule warps per inch, twined together with a pair of juniper bark cords. 9672, a fragment with its edge finished like 9520, has a doubled tule warp, 3 warps per inch, which are twined with a pair of 1-ply juniper bark cords, 3/16″ diameter, at intervals of 2″ to 2½″.

10333, another type of edge finish, is enlarged in figure 10, *a*. The tule is doubled back at the edge, giving a double warp, and the warps are bound together by 3 strands of braided cord. It is similarly fastened below the edge at intervals of ½″ to ¾″. This specimen is from a depth of 2′.

11603–3 (fig. 10, *f*) has a grass warp (*Scirpus americanus*), each ⅛″ wide, and 5 to 6 per inch. It is doubled over a thin willow (?) rod at the edge, just below which the warp elements are twined together with a pair of weft elements of the same grass. The twining elements turn down at the right edge, hanging free for 2″ until they turn back to the left to be twined across the face of the mat.

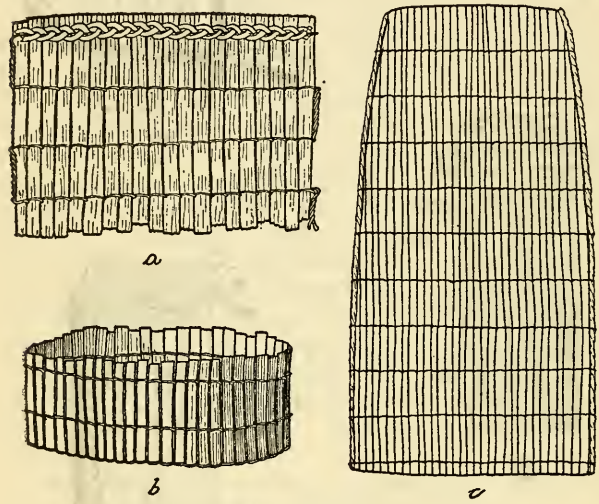


FIGURE 11.—Mat edges and tule bag.

10554 (fig. 10, *j*) has a warp made up of a bundle of tules, 2 warps per inch. The tules of a given warp bundle are bent over at the top edge to pass down into the warps on each side, and the bundles are twined together just under the edge. The right-hand edge is bordered with a pair of twisted cords, held in place by the twining cords.

9635 (fig. 10, *e*) is made entirely of willow stems (*Salix exigua*), 1/16″ in diameter, with the bark left on. The warps each consist of 2 stems placed side by side. The ends of these stems are either bent over at the upper edge so as to pass down into a neighboring warp or are used in the twining which forms the upper edge. A pair of stems, however, pass out to hang free along the right edge and are then twined back across the mat 2″ below the upper edge.

10555 (fig. 10, *g*) shows the corner of a complete specimen that may have been a cradle or carrying frame. It is 18″ long, 6″ wide. The warp is made up of flat strands, ⅛″ wide, like those used in coiled basketry, each of which is doubled over a round stick, ⅜″ in diameter, at the end, and runs back to provide another warp. Just below the stick they are closely twined with cord. Each side of the frame is provided with a round stick, ⅜″ in diameter, which stops just short of the end where it is bound to one of the warp elements with juniper bark. Starting 1″ below the end of the frame, juniper-bark strands are woven back and forth through the warp elements at intervals of ⅝″ to ¾″.

9582–6 (fig. 11, *a*) is the end of a mat 10″ wide. The warp is a bundle of tules, 2 warp elements per inch. The upper ends of the tules are simply cut off square. Just below the edge the warp elements are twined together by two 2-ply bark cords, over which a braid of 3 strands of tule is caught. The weft passes down the left end of the mat and back across the mat to the right edge, where it passes down the edge to cross the mat toward the left, etc.

10556 is a fragment of a mat, 6½″ long, 3″ wide. Each warp is a single tule stem folded lengthwise. It is twined at intervals of ½″ to ⅝″ with a pair of juniper-bark cords. The entire mat has been folded so that opposite edges nearly meet, where they are held by tying together free ends of twining cords.

9684 is a bundle of reeds tied with reed, perhaps matting material.

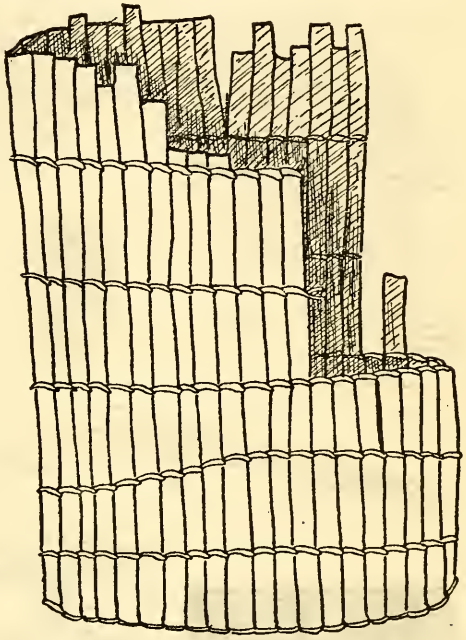


FIGURE 12.—Fragment of tule bag.

TULE BAGS FROM CAVE NO. 1.—11603–1 (fig. 12) is the bottom of a bag, 8½″ tall, 5½″ wide. Each warp is a bundle of tules which runs down one side of the bag, is folded at the bottom where a pair of twining cords fasten the warps together, and runs back up the other side. There are 3 to 3½ warp elements per inch. The pair of twining cords, which are of 1-ply juniper bark, run entirely around the bag at intervals of 1″ to 1½″.

11603–7 (fig. 11, *b*) is also the bottom of a bag, 8½″ wide, identical with 11603–1, except that the weave is somewhat more open. Each warp is a bundle of 2 or 3 tules, 2½ warps per inch. It is twined at intervals of 1⅜″ to 1½″.

11603–8 is a bag bottom, 9¼″ wide, the top missing. Each warp is a bundle of tough rush (?) stems, and there are 4 to 5 warp elements per inch. These are not folded across the bottom as in 11603–1 and 11603–7. It is closely and tightly woven, being twined with a pair of sinew thongs, each ⅛″ wide. The bag had been covered with deer or antelope hide, with the hair on the outside, which had been sewed on with sinew. Only traces of the hide remain.

BASKETRY.—The Promontory caves yielded 12 specimens of coiled basketry (pl. 6, *d*, *e*), of which all but 2 were found in Cave No. 1.

These fall into 2 classes, based upon the warp or foundation and upon the stitch. Five specimens (10377, 10609, 9654, 11110, and 11604–1) have a single rod foundation (occasionally an extra rod is added) and interlocking stitches (occasionally split in 10377). This type occurs in but is not characteristic of the Basket Maker and Pueblo cultures of the San Juan Valley,[16] the latter, like western basketry in general, having a 2- or 3-rod-and-bundle foundation.[17] Four specimens (9659, 9587–8, 11103, and 11604–4) have a single rod-and-bundle foundation and noninterlocking stitches. 11604–2 is exceptional in having a single rod foundation (with an extra rod added irregularly), but noninterlocking stitches. The two specimens, 11086, from Cave No. 2, have respectively a rod-and-bundle and bundle foundation, and both have split stitches.

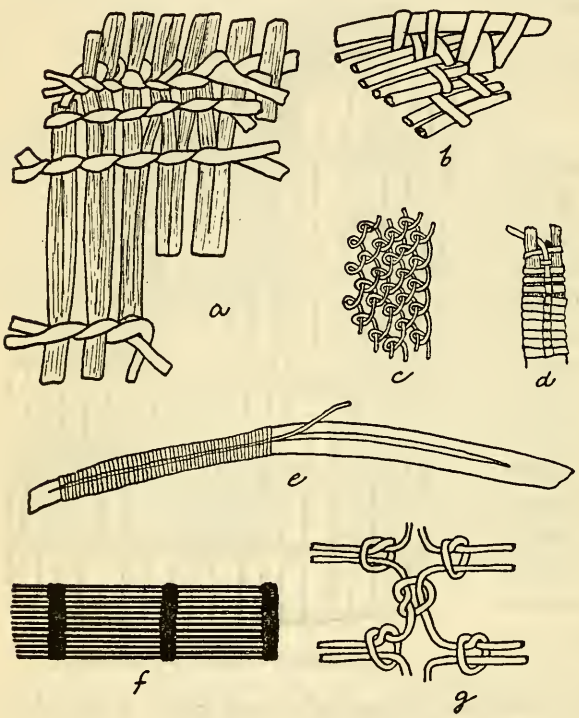


FIGURE 13.—Fragments of matting, basketry, netting, and cord.

The coiled basketry is firmly but not finely woven. No twined basketry was found. One fragment only, 10490 (fig. 13, *b*), seems to be twilled.

Specimens from Cave No. 1.—10377, fragment of a coiled basket. Foundation: one-half of twig, 3/16" in diameter, split lengthwise, the bark remaining on the lower, rounded side. Weft or sewed element: flat strip 1/8" wide, passing around 2 foundation elements; stitches interlock; some are split. This has 5 stitches and 6 foundation rods per linear inch, or approximately 30 stitches per square inch.

10609, fragment of a coiled basket. Foundation: slightly flattened rod, 1/8" wide. Weft or sewed element: flat strip, 1/8" wide; stitches interlock. This has 6 stitches and 5 foundation rods per linear inch, or approximately 30 stitches per square inch.

9654 is like 10609, except that the foundation is sometimes 2 rods instead of 1, placed either side by side or one on top of the other. It has 5 interlocking stitches per linear inch, or 25 to 30 per square inch.

[16] Weltfish, 1932 a, pp. 38–44.
[17] Weltfish, 1932 b, p. 109.

9659, fragment of coiled basket. Foundation: flat rod, 3/16" wide, over small juniper-bark bundle. Weft or sewed element: strip, probably of squaw bush (*Rhus trilobata*), which passes over the upper rod and under the lower rod through the bark bundle; stitches are noninterlocking. This has 9 to 10 stitches per linear inch or 55 to 60 per square inch.

9587–8, fragment of coiled basket, identical with 9659.

11604–4, fragment of coiled basket. Foundation: single flat rod, 3/16" by 1/8", and bundle. Weft or sewed element: noninterlocking stitch like 9659 and 9587–8. This has 6 to 7 stitches per linear inch or 24 to 28 per square inch.

11604–1, fragment of flat basket bottom, 5½" in diameter; probably from tray. Foundation: single flat rod 3/32" by ¼". Weft or sewed element: interlocking stitches. This has 4 to 5 stitches per linear inch or 20 to 25 per square inch.

11604–2, fragment of coiled basket. Foundation: flat rod, 1/8" wide; some have extra small rod. Weft or sewed element: noninterlocking stitches, which pass between the 2 rods above (when there are 2) but include both rods below. This is woven so as to give a diagonal effect. It has 25 stitches per square inch.

Specimens from Cave No. 2.—11086 is 2 fragments of coiled baskets. Foundation: flattened single rod, 3/16" wide over small amount of juniper bark. Weft or sewed element: stitches always split. This has 5 stitches per linear inch or 22 to 23 per square inch. The other fragment, perhaps from the same basket, is similar except that the foundation is entirely of bark.

10490 (fig. 13, *b*) seems to be the rim of a twilled "ring basket." The rod forming the edges is willow, 5/16" in diameter. The woven elements are of 2 kinds: Those running horizontally (in diagram) are stems 1/8" in diameter. The strips lashed around the rim and woven through the stems are flat strips, 3/16" wide. Both are probably squaw bush.

From between 2′ and 2′ 6″ deep came the fragment, 6″ in diameter, of the bottom of what was probably a large tray (11103). It is a coiled weave, having a foundation of a single flat rod, 1/8" wide, 1/16" thick, and a bundle of bark or other fiber, and is sewed with noninterlocking stitches, a few of which are split, which average approximately 7 per linear inch or 40 to 45 per square inch.

Another specimen (11110), from between 2′ 6″ and 3′ deep, is also the fragment of the center of a basket bottom. It is sewed, having a foundation of a single flat rod, 1/8" wide and 1/16" thick. The coils always interlock and run from 6 to 7 per linear inch, or approximately 40 per square inch.

11602–27, Cave No. 1, is the ends of two twigs lashed together, which had formed the rim of some sort of frame, possibly of basketry. One is a whole twig, ¼" in diameter; the other is a split twig 5/16" in diameter with its flat side turned in. The ends of the two are lashed together for 1¾" with sinew.

NETTING.—10513, from Cave No. 1 (fig. 13, *c*), is a fragment of netting 10" long, 1½" wide, which must originally have been much larger. The cord is of soft fibers, 2-ply twisted clockwise, each 1/16" in diameter. The weave is simple, as shown in the diagram, no knots being involved. It has about 49 meshes per square inch. Possibly this is a hair net.[18]

MISCELLANEOUS WEAVING.—10512, from Cave No. 1 (fig. 13, *f*), is the fragment of a band 12¾" long, ¾" wide. It is made up of 14

[18] Compare Loud and Harrington, 1929, p. 91.

strands running parallel, each being of 2-ply soft fiber, 1/32″ in diameter, twisted clockwise. The strands, instead of running the entire length of the band, run only to the knots where they are fastened to the strands on each side of them and to the strands coming from the opposite directions by overhand knots (fig. 13, *g*) which are pulled tight. These bands of knots are spaced 1⅛″ apart and lend an ornamental effect.

Figure 13, *d*, *e*, is a leather thong, ¼″ to ⅜″ wide, 5¾″ long, which has been split in two its entire length except for a short distance at each end. It is ornamented with 2 strands of material like that used in sewing coiled baskets. One strand is wrapped around the thong; the other is woven over and under the first (fig. 13, *d*).

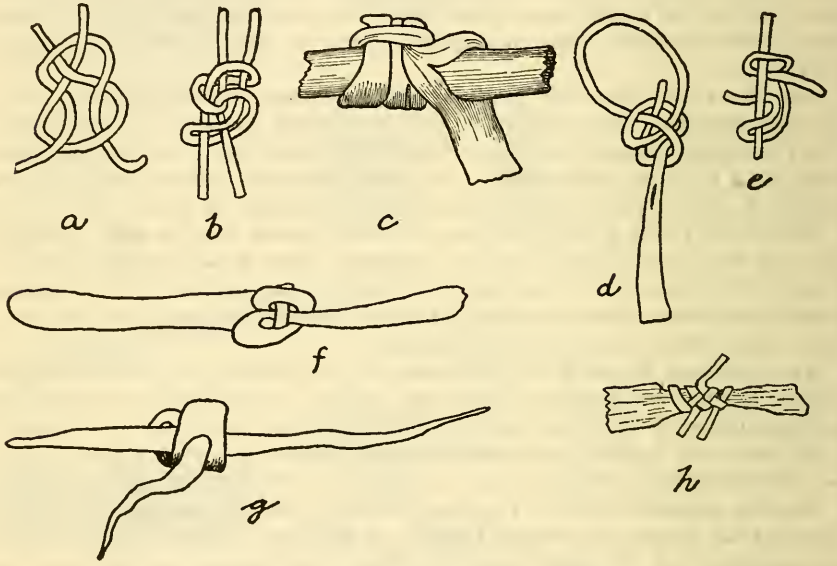


FIGURE 14.—Knots and buckskin fragment.

10584 (fig. 14, *h*) is a fragment of buckskin attached to a larger piece of buckskin. It is decorated by wrapping with 2 narrow strips of basket material as shown in the diagram.

KNOTS FROM CAVE NO. 1.—A number of different kinds of knots were employed by the Promontory people, of which the most common is the simple overhand knot. At least one of these occurs on nearly every fragment of cord. In addition to those on cords, several other specimens may be mentioned. A piece of sinew (10464), 4½″ long, ½″ wide, has an overhand knot at each end. A piece of thick hide (11589), 3″ long, is tied into a single overhand knot. A long strip of buffalo hide (11607–2) also has one.

A considerable variety of other knots was used on cord, sinew, and rawhide and buckskin thongs.

Square or reef knot. A strip of buffalo hide (11675), 4′ long with the hair remaining, is made into a loop by tying its ends together with a square knot. The square knot is also used on a number of small objects tied with cord.

False reef or granny knot. This was often used in place of the true reef or square knot.[19] It is used to tie together: 2 small strips of buffalo or elk hide (10175); 2 buffalo-hide thongs (9552); a piece of buckskin thong to a cord (10387) and 2 pieces of tule. Figure 14, *e*, shows 2 rawhide thongs (9627) each ½″ wide, tied together with what is the equivalent of a clove hitch made with one around the other, but which, if pulled out in flexible cord, forms a granny knot.

Single carrick bend. Figure 14, *a*, shows 2 pieces of rawhide (10548), each ⅜″ to ½″ wide, tied together with this knot. One piece is 20″ long.

Sheet bend or weaver's knot. This was used to tie together a piece of cord and a buckskin thong, ⅜″ wide (10569).

2 pieces of 2-ply cord (10558), each ⅛″ in diameter, are tied together with what resembles an Englishman's tie, except that the overhand knots interlock so that they cannot be slid apart.

Figure 14, *d*, is a piece of heavy hide (10312) from a buffalo tail which is 11″ long and very stiff and unyielding. Superficially, it resembles a bowline knot, but would, if pulled tight, form 2 half hitches around itself.

Figure 14, *f* (10171), is of stiff rawhide and is 20″ long. Each piece has been slit at one end. Then 1 piece has been drawn through the other and through the slit in its own end.

Figure 14, *c* (11606), is a strip of rawhide ¾″ wide, 7″ long, tied to a crude stick, ½″ in diameter, 8¾″ long, broken at each end. The stick passes through a loop in the rawhide which is then tied to the stick with a modified clove hitch.

10182 (fig. 14, *g*) is 2 rawhide thongs tied together. One has a slit cut in one end, through which the other end is passed to form a loop. This is drawn over the second thong.

Cord and rope.—A total of 76 specimens of cord, not counting those which formed parts of other specimens, were found, all but 2 of which were in Cave No. 1. The data on these are tabulated below. All, with exceptions mentioned later, are 2-ply, and are generally tightly twisted. The greatest number, 28, are made of a fairly fine but tough fiber from some unidentified plant, probably Indian hemp (*Apocynum*); 18 are of juniper bark; 16 are of a tough, coarse bark, probably of some large plant or tree; 6 are of tule; 2 are possibly of human hair; 2 are of sinew; 1 is of black buffalo hair; 2 are of hide of some sort; 1 is of a triangular-stemmed grass.

[19] Loud and Harrington, 1929, p. 85, found the granny to be three or four times more common than the square knot at Lovelock Cave.

Thirty-six, or exactly half, of the specimens are twisted clockwise, the other half counterclockwise. This would seem to indicate that the direction was chosen at random, yet all of the 14 cords which are more than ¼″ in diameter are twisted counterclockwise, whereas of the remaining 62 which are ¼″ or less in diameter, 38, or nearly two-thirds, are twisted clockwise. Thus the direction of twist seems to have some relation to the size of the cord.

The usual size is ⅛″ to 3/16″ in diameter, 49 specimens falling within these limits. The range of diameters is: 1/6″, 2 specimens; 3/32″, 5; ⅛″, 28; 3/16″, 21; ¼″, 5; 5/16″, 1; ⅜″, 3; ½″, 3; ⅝″, 3; ¾″, 3; 1″, 2.

A similar difference was noted at Lovelock Cave, practically all of the specimens defined as "rope" (tule and *Juncus*, 3 to 40 mm. in diameter) being twisted counterclockwise, whereas "cord" was twisted clockwise.[20] At Gypsum Cave, on the other hand, the direction of twist correlates with material used rather than with size.[21]

Specimens of cord from Cave No. 1

[In the following table CC indicates counterclockwise; Cl, clockwise]

Cat. No.	Direction of twist	Diameter cord	Material	Remarks
		Inch		
9580	Cl	3/32	fiber	
9602	Cl	⅛	bark fiber	
9603	CC	3/16	fiber	
9604	CC	¾	tule	Each ply 5 or 6 tules.
9610	Cl	3/16	fiber	
	Cl	3/16	do	
	Cl	¼	do	Each ply is 2-ply.
	CC	3/16	do	
9630	CC	1	tule	Each ply 5 or 6 tules.
	CC	1	do	Each ply is 2-ply.
9633	Cl	3/16	juniper bark	
	CC	3/16	fiber	
9647	CC	3/16	coarse bark fiber	
9657	CC	⅝	do	
9663	CC	¾	buffalo hair	End doubled back and sinew tied.
9669	Cl	⅛	fiber	
9674	Cl	⅛	do	
	CC	⅛	do	
9689	Cl	⅛	do	
9687	CC	3/16	bark fiber	
	CC	⅛	do	
	CC	⅛	do	
	Cl	⅛	do	
	Cl	⅛	do	
	Cl	⅛	do	
9690	Cl	3/32	do	
	Cl	3/32	do	

[20] Loud and Harrington, 1929, pp. 73–83.

[21] Harrington, 1933, pp. 158–161.

Specimens of cord from Cave No. 1—Continued

[In the following table CC indicates counterclockwise; Cl, clockwise]

Cat. No.	Direction of twist	Diameter cord	Material	Remarks
		Inch		
	Cl	1/8	sinew(?)	
0101	CC	5/8	cedar bark	
	CC	1/2	do	
0128	CC	1/16	sinew	
	Cl	1/8	fiber	
0309	Cl	1/8	juniper bark	Very loose.
0385	CC	1/4	human hair(?)	Knotted.
0387	CC	3/16	fiber	
	CC	3/16	do	
	Cl	1/8	do	
	Cl	3/32	do	Tied to last.
10394	Cl	5/32	bark fiber	For sewing matting.
10398	Cl	3/16	rabbit blanket	
	Cl	3/16	juniper bark	
	CC	3/16	do	
	Cl	3/16	do	
	CC	3/16	fiber	
10406	Cl	3/16	hide of some sort	
10405	CC	1/8	fiber	
	Cl	1/8	do	
10411	CC	1/8	juniper bark	
	CC	1/8	fiber	Two loops of basket material twisted in.
10468	Cl	1/8	juniper bark	
	Cl	1/8	do	
	Cl	1/8	coarse bark	
	CC	3/16	juniper bark	
	Cl	3/32	grass(?)	One strand is 2-ply.
10469	CC	1/2	tule(?)	
10516	Cl	1/4	juniper bark	
10532	CC	3/8	bark	
	CC	3/4	grass	Each strand is bundle of triangular grass.
10544	Cl	1/8	fiber	
10569	Cl	3/16	do	See under "Knots".
10552	Cl	1/4	bark fiber	
10574	CC	3/8–7/16	juniper bark	
10765	CC	5/8	bark	
11591	CC	1/4	black human(?) hair	
(1)	Cl	1/8	fiber	
	Cl	1/8	do	
	Cl	1/8	do	
	Cl	1/8	do	
	Cl	3/16	do	
	CC	5/16	tule	
	CC	1/16	sinew	
	CC	3/16	juniper bark	
	CC	1/2	do	
	CC	3/4	do	
	CC	3/8	tule	
	CC	1/8	fiber	
10203 [2]	Cl	3/8	juniper bark	
11554 [3]	CC	1/2	do	

[1] Miscellaneous. [2] From Cave No. 2. [3] From Cave No. 3.

Other fragments from Cave No. 1 used as cord are: 9554, a piece of sinew, ¼″ wide, split lengthwise and in part twisted counterclockwise. 9701, 2 buckskin thongs, each ⅛″ in diameter, knotted together. 9485, a strip of buffalo hide ½″ wide, with the hair remaining, twisted counterclockwise. 9551, buffalo hide thong or strap.

The following are also from Cave No. 1: 9705 is a bundle of rawhide thongs, each 3/16″ wide. 9688 is a 3-strand tule braid, 7/16″ wide. 10765 is a large loop of untwisted cedar bark. 11592 is the long black hair of a buffalo beard or tail, tied into a hank. 9632 is a 3-strand rush or grass braid, 5/16″ wide. 9611 is a bundle of sinew not yet made into cord; it is tied with a thong of thin skin, ½″ wide, 14¾″ long.

Fur and feather cords.—13 cords of fur or feathers, which were in all probability parts of blankets, woven like those of the modern and prehistoric peoples of the Southwest and Great Basin, were found. In no instance was the fur or feathers twisted on a foundation cord. 8 specimens are rabbit skin, 5 are bird skin (pl. 6, *c*).

Specimens from Cave No. 1.—11593, 3 strips of rabbit (?) fur, each ¼″ wide and twisted clockwise. 10467, 2 strips of rabbit fur, each ¼″ wide, twisted together. 9681, 9687, and 10533; each has 2 strips of rabbit skin twisted together clockwise. 10310, 2 thin strips of rabbit skin twisted together; buckskin thong attached. 9700 is a strip of rabbit skin, approximately 1½″ wide, the ends of which are fastened together with sinew to form a loop 7″ in diameter. 9702 is a cord made up of 3 to 5 strips of rabbit fur, each about ¼″ wide, twisted together.

11593 also includes a single strip of owl(?) skin, ⅛″ wide. 9549 is a single strip of gull(?) skin, ½″ wide. 9555 is a single strip of the skin of a grebe-like bird. 9556 is 2 strips of gull(?) skin, each ¼″ wide, twisted together. 10573, 8 specimens, each being 2 strips of gull or owl(?) skin with white down feathers, each ½″ wide, twisted together counterclockwise.

Miscellaneous Objects

Ornaments from Cave No. 1.—11565 (fig. 15, *a*) is the incisor tooth of a large rodent, wrapped at the root end with sinew, probably for suspension, and carved with designs formed by small dots and incised lines. It has traces of discoloration which suggest paint. (See "Dice" under "Games".)

11567 (fig. 15, *b*) is 2 pendants of neatly worked and polished abalone (*Haliotis*) shell, one 1″, the other 1¼″ long, tied together with a thread of sinew.

11570 (fig. 15, *c*) is an antelope or deer hoof, tied with a short piece of cord wrapped with quill, probably porcupine.

11566 (fig. 6, *j′*) is a tubular bird(?) bone bead, 1⅝″ long, 3/16″ diameter, made of a section of hollow bone cut square at each end and polished. Possibly 10510 (fig. 8, *h*) is a fragment of such a bead.

9538 (fig. 15, *g*) is a bead(?) made from a section of fossil crinoid(?) stem. It is ¾″ in diameter, 3/16″ thick, and has a hole 5/16″ in diameter in the center.

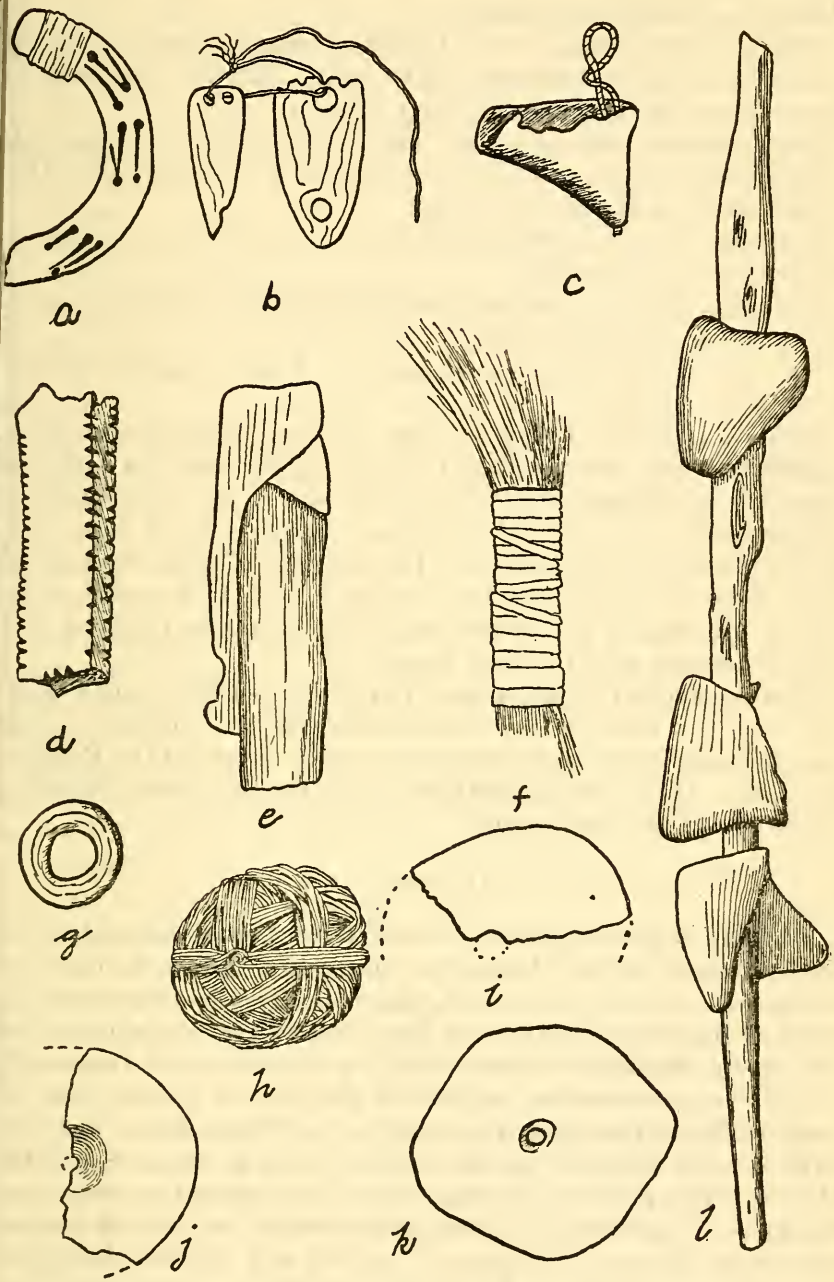


FIGURE 15.—Objects of bone, shell, hair, hide, pottery, and bark.

11534 (fig. 15, *d*), an ornamented bone, has been described under "Miscellaneous objects of bone."

10535 is a string of hackberry (?) seeds strung 5 per inch on a 2-ply cord which is 1/32" in diameter and 6" long. 9723 is 2 loose seeds of the same species. (See also "Pottery disks.")

Miscellaneous objects from Cave No. 1.—11601 (fig. 15, *l*) is a crude twig 8 3/8" long on which are impaled 3 antelope hoofs. This is not a rattle, as the hoofs are fixed.

9708 (fig. 15, *e*) is a crude splinter of wood 2 3/4" long, having its end wrapped with rawhide.

10511 (fig. 15, *f*) is a bundle of black buffalo hair, 3 1/4" long, tightly wrapped with a strip of bark.

10290 is a split stick, 3/4" in diameter, 6" long, wrapped with hide or sinew on one end.

10369 is a bundle of doubled tules, 5" long, wrapped with tules.

Miscellaneous objects from Cave No. 2.—11541–4 is a hollowed cane, 3/8" in diameter, 4 1/2" long. One end is cut square and the edge beveled; the other end is broken. One side has 3 holes, each 1/8" in diameter, burned into it. The first is 2 3/8" from the squared end; the second is 1 1/8" from the first; the third is 1" from the second and on the edge of the broken end. This might be regarded as a kind of flageolet were the holes larger.

Human skeletal remains from Cave No. 2.—11531, from a pack-rat's nest in a recess in the northwestern corner of the cave, is the only fragment of a human skeleton recovered in any of the Promontory caves. It is a very prognathous upper jaw of a youth, including the bottom of the nasal cavity.

Pottery

A highly distinctive type of ceramics (pl. 7, *f–j*) occurred in the upper levels of all the Promontory caves, Nos. 1, 2, 3, 4, 5, and 6; in Cave No. 7, near Connor's Springs; in Caves Nos. 8, 9, and 11, north of Bear River Bay; in the Black Rock Cave; along an ancient dry stream channel in Tooele Valley, 4 miles south of Grantsville (11259); in a mound on the Rollins property at Provo;[22] on the beach of Provo Lake near the mouth of the Provo River; and in a large cave at Lakeside on the western shore of Great Salt Lake (10863). This pottery is distinguished by the general crudeness and blackness of its finish, its coarse white temper, its lack of painted decoration, the use of "fingernail", incised, and punched decoration on olla exteriors, thickened and decorated lips, and the great preponderance of soot-encrusted olla sherds. It is proposed that it be called Promontory ware.

[22] Steward, 1933 a, p. 17.

Sherds from the bottom of the culture-bearing material in Cave No. 1 are identical with those found on and near the surface. 22 sherds (10484 and 10539) from between 2′ and 2′ 6″ deep are mostly quartz tempered (a few have mica) and have a black surface, some being stick-smoothed and a few polished with a pebble. They range from ⅛″ to ¼″ and average 3/16″ in thickness. A rim sherd (11097) from 2′ 6″ deep in Cave No. 2 is also entirely typical of the ware.

The ceramic features of this ware were previously described by the writer [23] but the ware has not been reported by anyone else. It is totally unlike the crude pottery found in caves along the Snake River in southern Idaho by Schellbach,[24] it bears no relation to the unbaked pottery from the middle Columbia River,[25] and it is distinctly different from that found in puebloan sites around Great Salt Lake.[26] It does not even closely resemble the ware from southern Nevada which is probably ascribable to the modern Paiute.[27] Sherds of the last, collected by Harrington and now in the Southwest Museum, resemble the cave pottery herein described in general texture of paste, type of temper, somewhat in finish, and in having "fingernail" decoration, but differ in their failure to have the characteristically widened lip with punched or incised decoration. The Paiute sherds, moreover, are from large conical bowls with pointed bottoms, whereas the cave sherds are, with very few exceptions, from ollas and bowls with round bottoms, no pointed-bottom vessels being found.

Indeed, it is far from certain that the cave pottery is a Shoshonean ware at all. Although the plain gray potsherds found by Lowie on the Whiterocks Ute Reservation in northeastern Utah are probably puebloan, not Shoshonean, Lowie adduces other evidence that the Ute, Southern Paiute, and probably northern Shoshoni made true but undecorated pottery in early historic times,[28] but there is nothing to link this to the cave pottery. The writer has procured descriptions of an unpainted ware from the Shoshoni throughout Nevada, Idaho, and northern Utah on all sides of Great Salt Lake. These descriptions do not tally with the cave ware. The only Shoshoni pottery actually seen is that from a camp site in the mountains east of Austin, Nev. This is almost identical with that of the Owens Valley Paiute in eastern California. Shoshoni pottery as known at present therefore differs sharply from the cave ware in its lack of the thickened, punched rim and the coarse quartz

[23] 1936, p. 18.
[24] 1930, p. 123.
[25] Ray, 1932.
[26] Steward, 1933 b; 1936, pp. 6–21.
[27] Harrington, 1927, p. 271.
[28] Lowie, 1924, pp. 225–226. "Black earthenware vessels with decorated rim" dug up from time to time on the Uintah Ute Reservation may correspond to the cave ware.

temper. Although the Promontory ware may be early Shoshonean, it is entirely possible that it was derived from some northern Plains people. Even that the Navaho introduced it from Wyoming or thereabouts during their southern trek should not be ruled out of consideration. Navaho water drums are definitely as like Promontory ware as are the various known Shoshonean ceramic types.

OLLAS.—*Clay and temper.*—The paste is, except in a very few sherds, rather coarse and is generally burned quite black. The usual temper is exceedingly coarse particles of quartz, which frequently show through the surface and stand out brightly against the black clay. Occasional sherds have mica temper in place of or in addition to quartz. The sherds from the beach of Provo Lake (11410) conform to this type, but several specimens have a dark, igneous temper. A similar ware from Mound 5, Provo (11440), has in some sherds a coarse quartz temper, in others a finely ground sand temper.

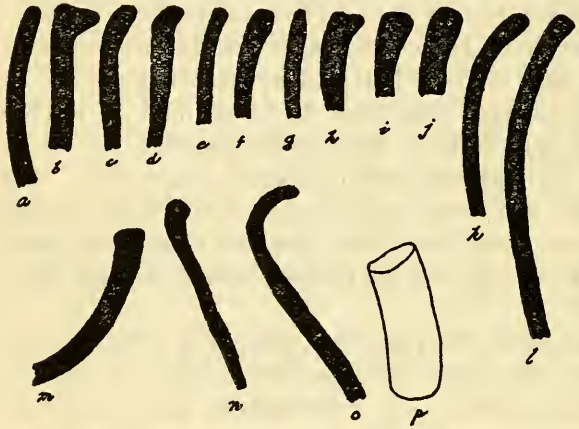


FIGURE 16.—Cross sections of pot rims.

Finish. — Vessels were first smoothed with a stick, the coarse scratches of which run horizontally on both the outside and inside surfaces. Some vessels were left with no further smoothing; others received a slight polish by rubbing, probably with a small smooth pebble, which left parallel marks about ¼″ to ½″ wide. A small, polished pebble (10478) from Cave No. 1 is flattish on one side and could have served this purpose. Vessel walls range in thickness from ⅛″ to ⅜″ and average 3/16″. The baking seems generally to have been accomplished in a smothered fire, for practically all sherds have a black surface as well as paste, and some have a satiny gloss. Use for cooking has generally added a substantial crust of soot. A few sherds, less fired, have a brownish cast, though very few could be described as light brown.

Vessel forms.—No complete vessels were found from which the entire shape could be ascertained, but rim sherds (pl. 7, *f*, *h–j;* figs. 16, 17, 18) indicate that the ollas were shaped very much like the water drums of the modern Navaho. The diameter of the mouth of the olla is nearly as great as that of the body, which is constricted to

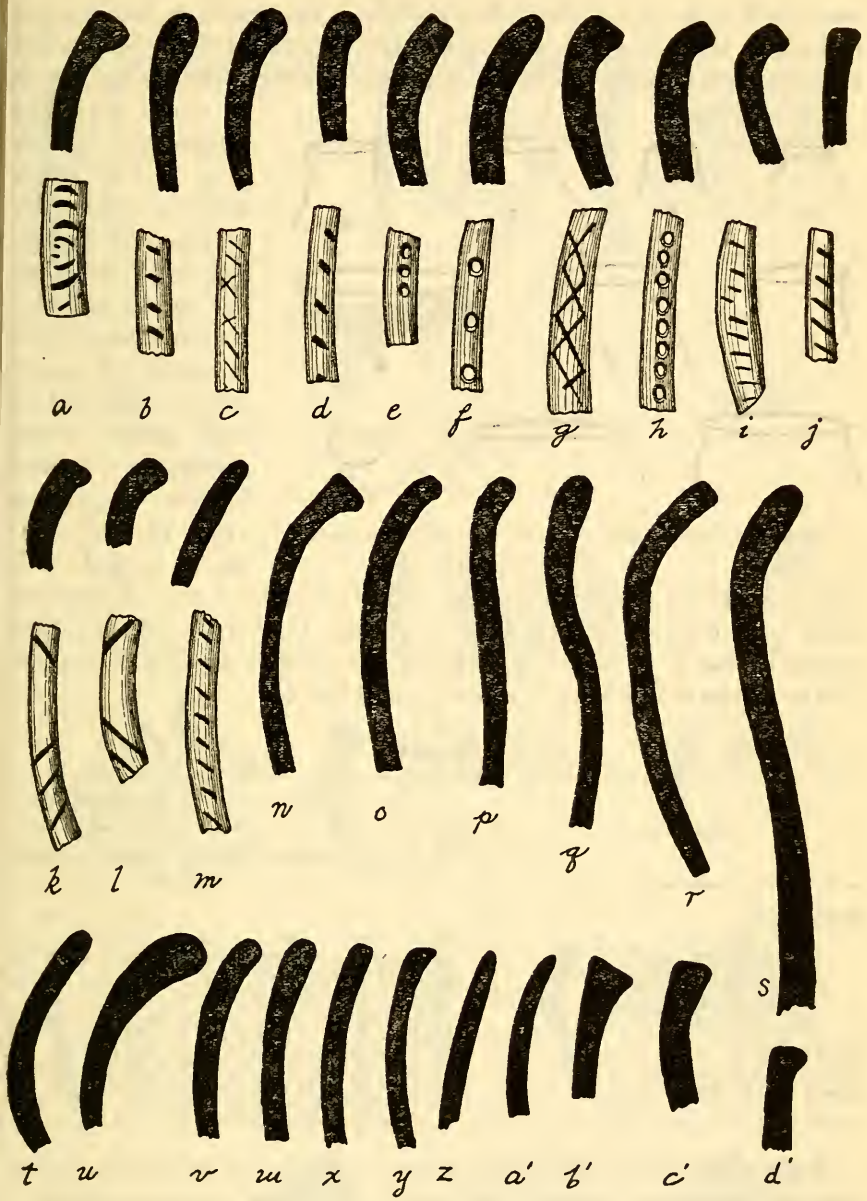


FIGURE 17.—Pot rims.

form a slight neck under the rim. A few rim sherds indicate exceptionally large vessels, the orifice diameters of the ollas in figure 18 ranging from 4″ (10304, fig. 18, *a*) to 13″ (9724, fig. 18, *g*). The curve of the rim sherds is single and regular, the only exceptions being 10349 (fig. 18, *i*), from Cave No. 2, which has a double curve,

and 10316 (fig. 19, *c*), which has a slightly thickened or raised ridge just under the rim. The most distinctive feature of these ollas is the rim, which is slightly thickened in practically every sherd, and which in many sherds ranges up to 3/8″ or even 1/2″ in width and is distinctly flattened on the top. The rims, whether flat or slightly rounded, are, in the majority of specimens, decorated with either short transverse incised lines or notches (figs. 17, *a–d*, *i–m*; 19, *a*, *c*, *j*, *k*, *m*), with a series of crossed lines (fig. 17, *g*), or with a row of punches made with the end of a stick or reed (figs. 17, *e*, *f*, *h*; 19, *h*). One specimen has 2 incisions or punches per inch, 3 have 3, 5 have 4, 7 have 5, 6 have 6, 2 have 7, 1 has 8, and 1 has 9.

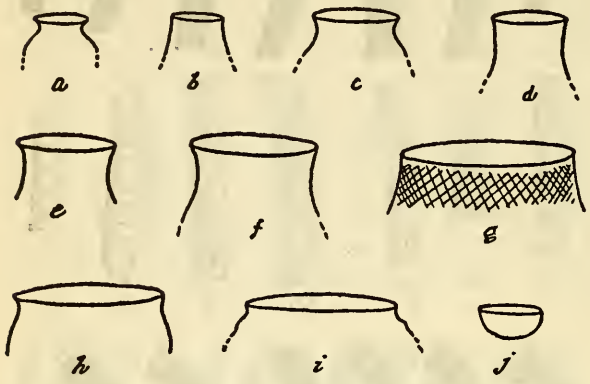


FIGURE 18.—Pottery olla neck and bowl reconstructions.

Sherds

Location	Total sherds	Rim sherds			Vessel thickness	
		Plain	Incised	Punched	Range	Average
Promontory:					*Inch*	*Inch*
Cave No. 1	649	24	40	3	1/8–3/8	3/16
Cave No. 2	17	5	0	0	5/32–1/4	3/16
Cave No. 3	96	0	1	0	1/8–3/16	3/16
Cave No. 6	8	0	0	0	1/8–7/16	3/16
Cave No. 7	13	0	0	0	3/32–3/16	1/8
Provo Beach	46	1	0	0	3/16–3/8	1/4
Provo No. 5	122	7	4	2	1/8–3/8	3/16–1/4
Black Rock Cave	37	0	0	0	5/32–5/16	3/16–1/4

Body decoration.—The sides of most vessels are left plain, but a few are ornamented with incised lines. The most common ornamentation is "fingernail" impressions, probably made by pressing the thumbnail into the soft clay to make a row of slightly curved vertical lines. 10304 (fig. 19, *a*), 9510 (fig. 19, *n*), and 11512 (fig. 19, *p*) from Cave No. 1, and 11513 from Cave No. 5, illustrate this. Other sherds are ornamented, usually just under the rim, with a coarse crosshatching drawn with the blunt point of a stick. 10316 (fig. 19, *b*), 10546 (fig. 19, *i*), 2 sherds, 9724 (fig. 19, *l*), 11512 (fig.

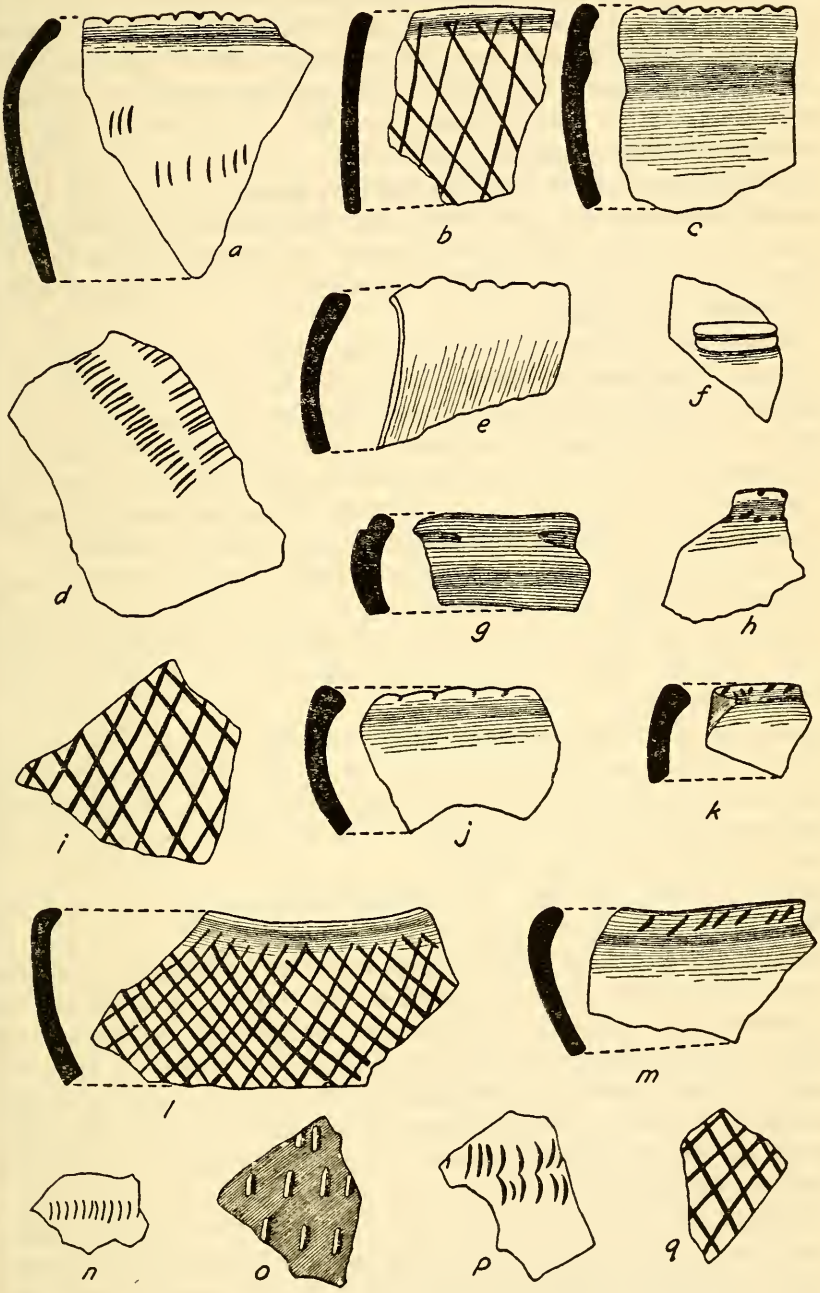


FIGURE 19.—Pottery decoration.

19, *o*), 10580 and 10294 from Cave No. 1. 9724 has punches, made with the end of a small stick, 3/16″ apart, just under the rim, and similar punches, 1/4″ apart, on the rim. 10546 (fig. 19, *h*) is similar. Another sherd, 9724, has two short rows of vertical incisions which are somewhat broader than fingernail impressions and were probably made with a blunt stick. 11440, from Provo (fig. 19, *g*), has deep incisions or impressions just inside the rim.

The only specimen with a stuck-on decoration is 10546 (fig. 19, *f*), a sherd from near the neck of an olla, which has an applied ribbon of clay 5/16″ wide, with a groove made by drawing the point of a stick along its center. 11517, from Cave No. 6, includes 1 sherd with traces of red paint.

Bowls.—Bowls are exceedingly rare. Cave No. 1 yielded only 4 sherds. The paste and temper are somewhat finer than that in the ollas, although several sherds (9510 and 11512) are quartz tempered. One sherd of 9510 has a fine paste with mica temper; 9719 seems to lack temper entirely. These range from dark brown to black. A bowl rim sherd from Cave No. 5 (11526) has a rounded lip, is tempered with coarse gravel, and is badly burned and soot-coated.

11440 (fig. 16, *m*) is a bowl rim from Provo, Mound 5. It is crude and coarse, having a quartz-sand temper and a rough and irregular surface inside and outside. The complete bowl had been about 4″ in diameter and about 2½″ deep. The rim is slightly thickened, like the olla rims.

Handle.—Only one handle (11440, from Mound 5, Provo) is represented in the entire collection. It is only a fragment, 2″ long, with a slight curvature; it averages 3/4″ in diameter. Possibly this, like several sherds mentioned below, was introduced into the mound from a puebloan village nearby.

Repairs.—One specimen only (10875, from Cave No. 4) is drilled with a hole, probably to repair a crack.

Potsherds which resemble puebloan ware.—A number of sherds were found in the sites mentioned herein which are so similar to the ware found in the puebloan pit lodges that they deserve special notice. Other evidence, mentioned below, makes it doubtful, however, whether they prove a contemporaneity of the cave and pit-lodge dwellers. Moreover, some of these sherds, at least, may be simply variations of the standard ware which fortuitously resemble the puebloan ceramics.

Of the total 649 sherds from Cave No. 1, only one sherd (11512) resembles the puebloan ware. It has a light sandy brownish paste which is tempered with a dark igneous rock. Its exterior finish has a glossy, somewhat crackled, brownish gray like the flaring-mouth ollas from Grantsville and other pit lodges described elsewhere.[29]

[29] Steward, 1936, pp. 6–8.

Although this was mixed with refuse bearing the usual cave type of sherds, its presence may be accounted for by previous occupation of the cave by the puebloan peoples or a chance variation of the standard ware. A somewhat similar sherd (11526) was mixed with typical cave sherds in Cave No. 5. Some of the otherwise typical cave sherds, however, contained igneous temper.

Further evidence of possible contemporaneity of the two cultures is afforded by a collection of sherds (10659) from a mound, which was recently destroyed, in the marshes bordering Great Salt Lake below Brigham City. Of 30 sherds, 6 are from definitely puebloan black-on-gray bowls; 6 others are olla rim sherds with thickened lips like the cave ollas. They are sand and quartz tempered, some having particles as coarse as in the cave ware, but all having a dark gray clay and surface finish. The remaining 18 sherds have a coarse paste, quartz-sand temper, and rough finish so that they resemble the cave ware decidedly more than the puebloan ware. As this mound was destroyed it cannot be determined whether the two kinds of sherds were originally associated.

One sherd of the 46 from Provo Beach (11410) is identical in paste, temper, color, and finish with the puebloan black-on-gray ware and bears traces of what may even be a gray slip on the interior surface. Because, however, these sherds all came from the surface of the beach, this association does not prove contemporaneity.

More convincing evidence, however, is from the mound on the Rollins property in Provo.[30] In addition to several sherds which bear a striking resemblance to the large flaring-mouth ollas of the puebloan culture, one (11440) is a black-on-gray sherd with an exterior coating of fugitive red, and another a stick-impressed sherd, both from definitely within the mound. There is no question that the last two are of puebloan origin and that the mound was not disturbed. There is, however, a puebloan pit-lodge village less than a quarter of a mile away. If it be assumed that the two cultures existed at the same time, an assumption which is scarcely tenable in the light of other evidence, the failure of these two groups to exchange more artifacts is surprising. That a puebloan individual dropped these on the site after it had been abandoned is unlikely, for other evidence suggests that the cave culture was later. The only remaining possibility, then, is that some individual of the latter culture picked these up from the surface of the abandoned puebloan village—the sherds must have been conspicuous then as they are now—and dropped them in his own village.

Pottery disks.—Two disks (11560, fig. 15, *j*, and 11563, fig. 15, *k*) from Cave No. 1 are irregular in circumference but each averages approximately 1¾″ in diameter, and is drilled in the center with a

[30] Steward, 1933 a, p. 17.

hole 1/8″ in diameter. One (11543), from Cave No. 3, is 1 1/8″ in diameter. Another (11518, fig. 15, *i*), from Cave No. 6, resembles 11560 and 11563. These are more likely ornaments than spindle whorls.

Object of unbaked clay.—11088, from Cave No. 2, between 2′ and 2′ 6″ deep, is a broken rectangular pellet of unbaked clay with rounded edges, 5/8″ long, 1/2″ wide, 1/4″ thick. Its original length was greater. It gives no indication of its purpose.

Articles of Hide

Although a very large number of specimens of leather and hide were recovered from the Promontory caves, most were so fragmentary as to make it impossible to ascertain their original use. One specimen was woven of rawhide thongs; several were perhaps drum tops; and several were bags. Of the remainder, not a single article of clothing, except mittens and moccasins, could be identified with certainty, most of the specimens appearing to be scraps and trimmings.

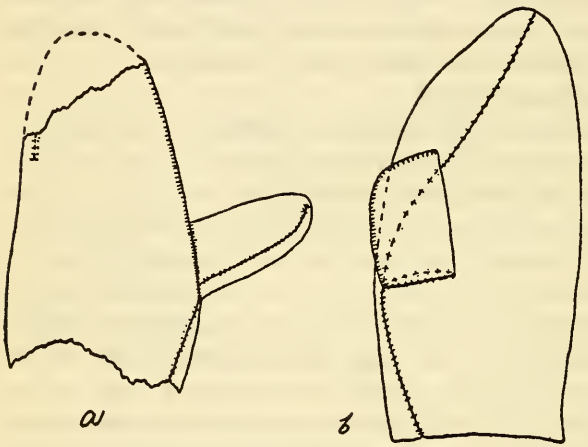


Figure 20.—Mittens of hide.

Little, moreover, could be ascertained concerning the manner of treatment of hides. Some were scraped; others, of buffalo, deer, and antelope hide, had the hair remaining. A number had been tanned and were still soft; a few were brownish, suggesting that they had been smoked.

Mittens.—Cave No. 1 yielded 2 specimens of mittens (fig. 20, *a*, *b*). Although only the thumb is differentiated from the remainder of the hand in each one, some skill in tailoring is indicated. One (11588–1, fig. 20, *a*) is of thin skin, probably antelope, which has a few hairs remaining on its exterior. It is not clear whether this is moth-eaten or was originally more or less scraped. The original length, from wrist to finger tips, must have been approximately 9″, but at present each end is somewhat decayed. The main part of this mitten is of a single piece of hide, which has been cut so as to be widest at the level of the thumb and which tapers toward the finger tips, with the seam running up the edge on the thumb side. The seam probably

ran across the finger tips and turned down again, for there is a short bit of seam on the palm near the left edge, though this may be simply a mend. It is sewed with twisted sinew, stitch 1 (see fig. 21), seven stitches per inch, with the seam turned in. The thumb, which is 3″ long, is a separate piece, sewed like the body of the mitten with the seam turned in and running from a pucker at the end down the lower side of the back. It is added by sewing into the seam of the mitten.

The other (11588–2, fig. 20, *b*) is of buffalo hide with the hair remaining on the exterior. It is clearly for the left hand. It is 10″ long. The main part is one piece, with its lower edge cut plain. The seam runs down the palm from the finger tips to the left edge (as seen facing the palm) at the level of the thumb and then turns inward somewhat toward the center. This sewing is with stitch 1, 3½ per inch. Whereas the thumb of 11588–1 is in the same plane as the mitten, the thumb of 11588–2 is perpendicular to it. That is, from the seam a slit 1¾″ long was cut across the palm to which the base of the thumb was sewed. The seam of the thumb runs up its left side and across its top.

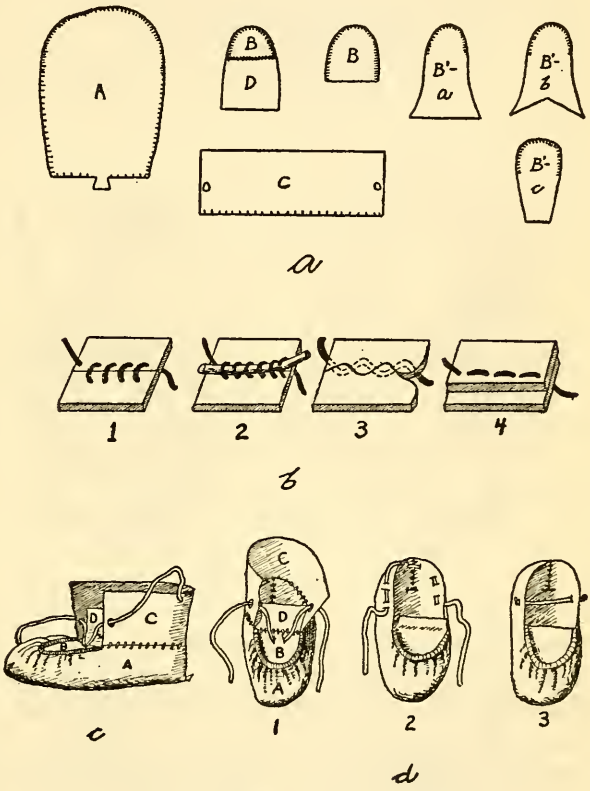


FIGURE 21.—Moccasin construction.

WOVEN RAWHIDE.—11595 (fig. 24) from Cave No. 1 is made of rawhide thongs ⅜″ to ½″ wide. The strands across the top are twisted and wrapped. Pairs of strands twisted clockwise descend from these at intervals of 1″ to 1½″. The weft is made up of single strands twisted into the warp strands. The specimen as shown (fig. 24) is 9¾″ by 7½″.

DRUM TOPS (?).—These are from Cave No. 1. 9625 (fig. 25, *a*) is a piece of buffalo hide from which the hair has been scraped. It measures 15″ by 17″, is unornamented, and is perforated around the edge with 22 more or less evenly spaced holes. These holes are pulled out so as to indicate that the hide was stretched in some manner. Although it is squarish rather than circular, it may have been a drumhead, or possibly a shield. 10235 (fig. 25, *e*) appears to be the edge of a similar object, but has some buffalo hair remaining on one side. Its longest dimension is 17½″. 5 holes remain on the edge. 9626 (fig. 26) is shaped somewhat like the last, is made of buffalo hide with the hair remaining on one side, and is 24″ long, 8″ wide. One edge is straight and has 5 holes, including one at each corner; the remaining edge forms the arc of a circle and has 7 holes, more or less

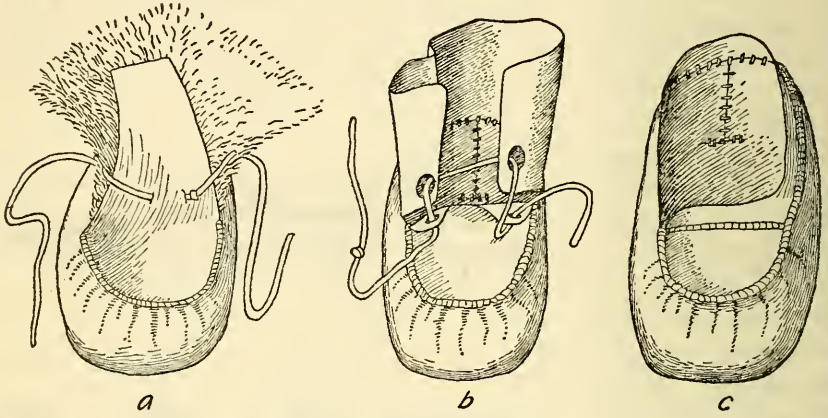


FIGURE 22.—Unusual moccasins.

evenly spaced. There is a small tear just off the center. Although this also was stretched in some manner, its shape precludes its having been a drumhead or shield. Another specimen (9534) is of buffalo hide from which most of the hair has been removed. It is roughly oval, the long diameter being 18″, the short diameter 12″. Its edge is perforated with 10 holes, more or less evenly spaced, each hole being a slit about 1″ long stretched nearly to roundness to form loops. 10238 is a somewhat similar piece of scraped buffalo hide, which is more or less squarish, measuring 13″ by 15″. It has several holes.

BAGS.—From Cave No. 1. Figure 27, *a* (10177), is a bag made of very thin skin, probably rabbit, with traces of downy hair on the exterior. The whole is reddish in color, perhaps stained with red paint. It is made of a single piece of skin which was cut as shown in figure 27, *b* (this is represented on a smaller scale than figure 27, *a*). This is folded in the center, edges *b* and *b′*, *a* and *a′* being laced together with a buckskin thong which is ⅜″ wide. The edges *b* and *b′*

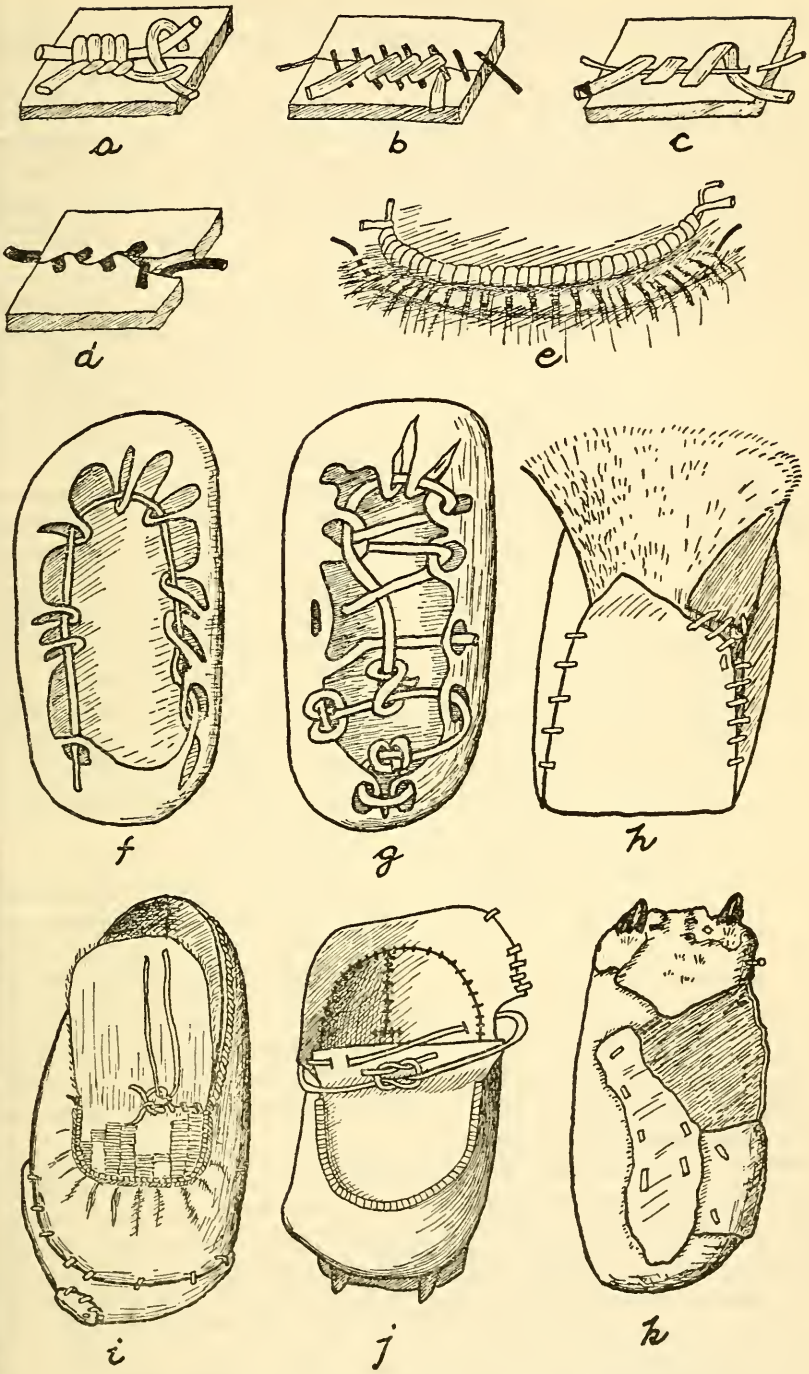


FIGURE 23.—Special types of moccasin stitches and styles.

are drawn to make a pucker and are further tied with cord. The top side is badly torn. As shown in figure 27, *a*, the bag is approximately 3½″ in diameter.

Another specimen (10277) may be a section of a cylindrical bag of rabbit (?) skin, with the soft fur left on the outside. Opposite edges of the hide are sewed together with sinew to form a tube which is 5½″ tall and approximately 4½″ wide. An extra strip is added across the bottom. The lower end of the "tube" is open, so that if it is a bag, the bottom has been lost.

Figure 25, *c* (9689), is the bottom of a bag (?) of heavy buffalo hide, 3½″ tall, 2½″ in diameter. It is made of two pieces, sewed together partly with sinew, using stitches 1 and 3 as on the moccasins, and partly with cord, using stitches 1 and 4.

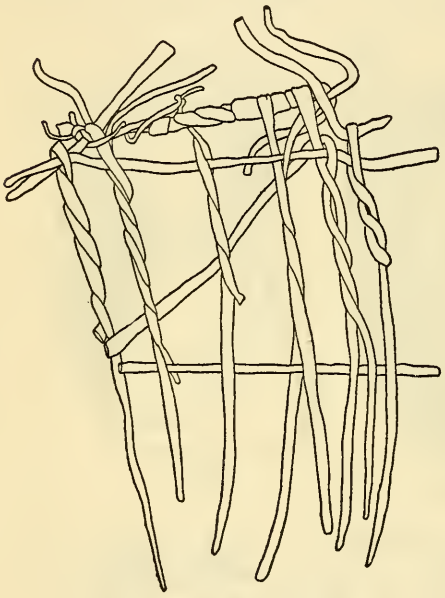


FIGURE 24.—Woven rawhide.

OTHER OBJECTS OF HIDE.—From Cave No. 1. 11582 (fig. 25, *b*) appears to be a section cut from a legging. It is 7″ wide, 4″ tall, made of well-tanned hide (buckskin?). The seam is sewed with stitch 1, 6 per inch. From this seam hangs a fringe ¾″ long, 12 per inch. It is repaired with 3 crude patches, each fastened on with stitch 4.

11584–20 (fig. 27, *c*) is a piece of scraped and probably tanned deer (?) hide 6½″ long and roughly oval in shape. It has been folded along the center of the long axis and the two sides brought together at one end where they are tied with sinew.

10077 is a piece of deer or antelope skin 11¼″ long with the hair remaining. It is more or less oval in shape, though slightly constricted in the center, making it somewhat like a dumbbell. A small hole was cut in one edge near the middle for fastening.

FRAGMENTS OF HIDE WITH FRINGE.—From Cave No. 1. 9703, fragment with fringe 7½″ long, 8 per inch. 10201, small piece of buckskin with fringe 2″ long. 10167, fragment of deer or buffalo hide with fringe 1½″ long. 10279, similar, with fringe 4″ long. 11584–9, scrap of buffalo hide with hair still on, having ¾″ fringe on one end. 10052, strip of deer hide from which most of the hair has been scraped, about 16″ long, 2″ to 3″ wide, with a fringe ¼″ to ⅜″ long on one side and end. 10550, scrap of deer or antelope skin with hair still on and fringe 1½″ long, 6 per inch. 10549, like 10550, 20″ long.

10173, from Cave No. 2, is a scrap of deer hide, 8″ long, about 3″ wide, from which most of the hair has been scraped; one edge shows traces of sewing and one end has a fringe about 1″ long.

MISCELLANEOUS FRAGMENTS OF SEWED HIDE.—From Cave No. 1. 10190 is two fragments of a thin tanned hide, sewed together with sinew, stitch 1, and the seam turned to one side. 10081 is a roughly circular piece of leather or tanned hide, 3″ to 3⅛″ in diameter, which shows evidence of sewing around its entire circumference. 10103 is a rectangular fragment of deer hide with the hair still on, 9½″ long, 3″ wide, perforated with a hole at one end, and showing traces of sewing on one side near the other end. This is about the correct shape and size for a moccasin upper; the hole could have served for the tie string. Another specimen, 17″ long and roughly 8″ wide, though irregular in shape, has one edge sewed with sinew, twisted clockwise, 1-ply, 1/16″ diameter. A second piece of hide was sewed to part of this edge. A cut or tear in the piece was repaired with 1-ply fiber cord, 1/16″ in diameter, stitch 1; part of the cord only remains.

Other scraps are: 11584–34, 11584–16, fragments of scraped buffalo hide having their edges sewed with stitch 1. 11584–23, a fragment of scraped deer (?) hide sewed with stitch 1. 10316, rectangular fragment of hide, 12½″ long, 5″ wide, one edge of which shows traces of sewing; possibly moccasin upper. 10476, 2 strips of thin tanned buckskin (?) having their ends sewed together with stitch 1; a short fringe sticks out along the seam.

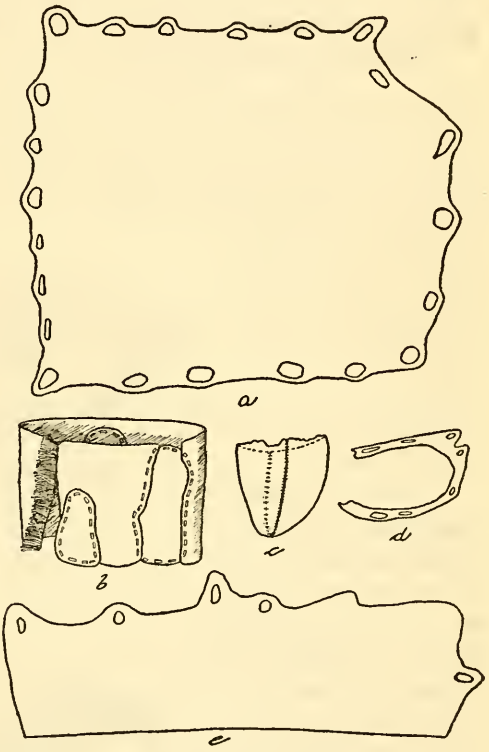


FIGURE 25.—Objects of hide.

10762, irregular fragment of buffalo hide with several small fragments of sinew caught through the edge at a single point. 11584–18, fragment of hide, repaired at several points with stitch 1. 11584–6, irregularly oval fragment of hide, 10″ long; a small protrusion from the edge, 1½″ long, is decorated with basketry material (fig. 14, *h*). 10345, irregular piece of deer (?) hide, having 3 splits repaired with stitch 1. 11584–4, rectangular piece of scraped buffalo hide, made of two pieces sewed together with stitch 1; the entire circumference shows evidence of sewing with stitch 1. 11584–2, fragment of buffalo hide with its edges sewed with stitch 1; perhaps moccasin patch.

TRIMMINGS.—From Cave No. 1. Several specimens are long, narrow strips perforated with slits which have generally been stretched sidewise into loops, as if the pieces were trimmings from the edge

of skins which had been staked or stretched out for scraping. 10166, length 9¼″; perforation each end. 11584–32, strip 5′ 6″ long, having holes through which the stakes were presumably driven, every 3″ to 5″. 11587–7 and 11587–5, fragments of a similar piece. 10311 (fig. 25, *d*) is a fragment of thin deer (?) skin, which, if stretched out, would be approximately 8″ long. It bears traces of red paint.

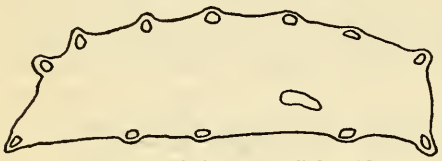


FIGURE 26.—Object of buffalo hide.

SCRAPS OF DEER AND ANTELOPE HIDE.—From Cave No. 1. 10234 is a fragment and 9559 is a strip 19″ long, ½″ wide of deer hide with hair. There are 7 fragments of scraped hide. 10173 is very red, perhaps painted. Three specimens are tanned and are probably trimmings from garments or other articles. 10479 is a fragment of soft tanned buckskin with a slit ⅝″ long. 10608 is a fragment of soft tanned buckskin, somewhat brown on one side as if it had been smoke cured.

Cave No. 3 also yielded a scrap of tanned hide.

SCRAPS OF BUFFALO HIDE.—13 specimens from Cave No. 1 and 1 from Cave No. 3 are fragments with hair remaining. 20 other specimens from Cave No. 1 and 1 from Cave No. 2 are scraped fragments. The following are from Cave No. 1: 10186, a more or less circular piece, 5″ in diameter; 10524, similar, 3″ in diameter; 10475, perhaps a moccasin gusset. 11584–15 is a thin strip 24″ long, probably a trimming. 2 fragments from Cave No. 1 and 1 from Cave No. 3 are tanned and are probably trimmings from garments.

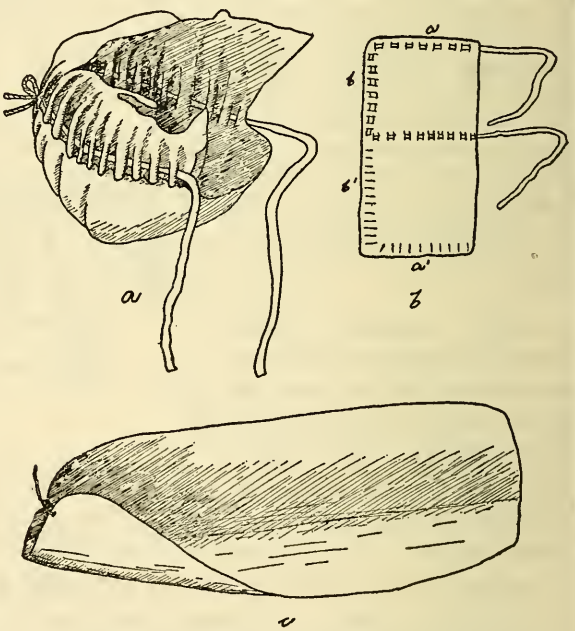


FIGURE 27.—Skin bag and object of hide.

SCRAPS OF MISCELLANEOUS MATERIALS.—From Cave No. 1. 11590 and 11584–31, thin membrane, perhaps bladder. 10069, fragment

of large bladder. 10481, fragment of the skin of a small animal, perhaps a rodent, with fine yellowish brown hair. 10433, fragment of thin membrane in 2 strips, slightly twisted together. 10233, buffalo tail 15″ long; upper 4″ of bones have been removed and skin cut and spread out; below this the hair has been scraped off, leaving only part of tassel.

11558–2, from Cave No. 3, is a thin parchment or bladder fragment.

HAIR.—From Cave No. 1. 10519 is a small amount of detached deer (?) hair, part of which is stained with red paint. 9661 is a buffalo tail with the hairs attached to only the last 2 or 3 bones or cartilage. 9589 is a bunch of black buffalo-tail (?) hair.

MOCCASINS

The Promontory caves yielded 250 specimens of moccasins, all but two of which were found in Cave No. 1. Most of these are in a fair state of preservation and are comparatively complete, but extremely brittle, making examination of them somewhat difficult. The construction of 237 moccasins is substantially the same (pl. 7, *a–e;* figs. 21; 22, *a–c*). One specimen is a modification of this (fig. 23, *h*), 5 are entirely different in construction (fig. 23, *f*, *g*), 8 are simply pads or lining; 3 are small fragments of an undeterminable form. The variations in form do not correlate with location or depth. The construction of the standard type will be considered first.

CONSTRUCTION.—Figure 21, *a*, shows the cut of the various parts of a typical moccasin. In all specimens at least two parts are used, a lower, part A, and a gusset or insert, part B; in most, an upper, part C, is added. A few have a separate tongue, part D.

Part A is definitely of buffalo hide in 169 specimens, probably of buffalo hide in 30 specimens, of antelope or deer hide in 19 specimens, of elk or bear hide in 1 specimen, of undetermined material in 19 specimens. 11582–36 is of buffalo hide and is the only specimen which has the hair left on the outside of part A. Part A is cut as shown in figure 22, *a*, a T-seam being used on the heel which is cut so as to leave a short tab protruding from the bottom of the seam. The front is brought up over the toe and deeply puckered around the gusset, part B (pl. 7, *a–e*). Part A shows less variation than the other parts.

The gusset, part B, is usually of the same material as part A, but in a few specimens it is of a thinner material. In all but 4 specimens the hair has been removed, although exposure to insects or weather may account for this on some. 3 (11582–58, 10241, and 10059) are of deer or antelope hide with the hair inside; 9760 is of buffalo hide with the hair inside. 25 specimens have only part B (fig. 22, *b*), its

upper edge being unstitched and plain (pl. 7, *c–d*), probably indicating that there was no tongue.

Other specimens, however, have longer gussets, type B′, which range up to 8″ in length (10083) and provide tongues of which three styles are recognizable (fig. 21, *a*). In type B′–a, found definitely on 21 specimens and probably on 4 others, the tongue broadens and is cut straight across the top (pl. 7, *a*). In type B′–b, found definitely on 18 specimens and probably on 3 others, the tongue has a shallow V-notch in its top, making it double pointed. In type B′–c, found definitely on 5 specimens and probably on 1 other, the tongue tapers toward the top, which is cut square. 18 other specimens have a long tongue, type B′, the substyle of which cannot be ascertained.

On 29 specimens part B is very short (for example, 1″ long on 11582–40 and 1⅛″ long on 10243) and had added to it an extra piece, part D, which constitutes a short, square tongue (fig. 21, *c*). On 32 other specimens the free edge of part B is stitched, probably indicating that part D, which is usually of a thinner, more perishable hide than the remainder of the moccasin (10063, for example, has an exceedingly thin part D), had been present but was later removed or decayed (pl. 7, *b*).

For 72 specimens the nature of the gusset cannot be determined.

A number of specimens have variations in the gusset. On 10062 it is very irregular. On 10253 it is B′–c type, 7″ long, pointed, and has one side scalloped. On 9756, also B′–c type, it is pointed and its right edge has a fringe ½″ long. On 10168 the lower end of B is squarish instead of having the usual semicircular form. On 10241 (fig. 23, *i*), it is type B′–c, with the top of the tongue, which is made of deer skin with the hair inside, rounded; the lower part of the gusset is decorated with 8 adjoining perpendicular bands of quill (probably porcupine) embroidery, the stitches running horizontally. On 10157 a strip ¼″ to ⅜″ wide is sewed between the gusset and Part A, as if the original gusset had been worn or torn, then all but a narrow strip cut away and a new gusset sewed in. On 10257 (fig. 22, *c*) the lower edge of part C, which is largely cut away, runs across the gusset of type B to which it is sewed as if it were part D. 10176 and 10261 are type B′–b, but the tongue of each has a point on one side only.

The usual form of part C is a rectangle (fig. 21, *a*, *c*) which is sewed to the upper edge of part A from one side of the gusset around to the other. On some specimens it projects forward from where it is sewed (fig. 22, *b*) so as to fold across the ankle. Either the whole or fragments of part C are present in 72 specimens. In 96 specimens the upper edge of part A is stitched, but C is lacking (pl. 7,

a–d), probably indicating that part C had been very perishable hide which has disappeared. Only 10 specimens have the upper edge of part A left plain and unstitched, probably indicating that part C had been omitted from these, while 57 specimens were in such state of decay as to make the presence of part C impossible to determine. If those specimens which have the upper edge of part A stitched are considered as once having had uppers, we should have part C present on 168 out of 178 specimens on which data are available, and definitely lacking on only 10. Many specimens, however, suggest that part C was removed while the moccasin was in use, for they have ties of type 2 or 3 which very probably could not have been used with uppers.

The heights of the uppers or parts C in those specimens in which it is complete are as follows: 2½″, 1 specimen; 3″, 7 specimens; 3½″, 5 specimens; 4″, 14 specimens; 4½″, 3 specimens; 5″, 4 specimens; 6″, 1 specimen; 7″, 1 specimen.

A number of examples of uppers are of special interest. On 3 (11582–51, fig. 22, *a*, 10269, and 10085) it is of two pieces of buffalo hide sewed together with the hair turned inside. On 2 (10176 and 10089) it is of deer or antelope skin with the hair turned inside. The top edge of the latter is bordered with a fringe ⅜″ long. On 1 (10159) it is deer or antelope hide, and on 2 others (10092 and 10346) it is an extremely thin skin from a rabbit or other small mammal. On 10055 it is 4″ high and has a fringe 2″ long, 5 per inch, on its upper edge. 11582–6, 5″ tall, has a fringe 1½″ tall, 4 per inch, along its top. The front edge of part C on 10245 is slightly fringed. On 9764 the fringe on the top edge of C is 1½″ long. On 10062 the top edge of part C is cut into shallow scallops. On 10058 it is 4½″ tall, made of two pieces patched together. On 10107 it has an extra piece sewed on the right side at the front. On 10105 it is of deer or antelope hide and is made of four or more pieces. On 11582–41 it is 4″ high and made in two pieces. On 9748 C is of two pieces, the lower one being 3″ high and the upper, which was added later to increase the height, 4″ high. It extends across B, to which it is sewed from each side. On 10257 (fig. 22, *c*) it is cut away almost down to the upper edge of part A and runs across part B from the left side, being sewed to B as if it were part D. On 10118 part C is sewed to B for 1″. In somewhat similar manner, on 9759 it extends halfway across B from the left side and is sewed to B. On 9755 and 10143 there is one set of stitches on the upper edge of A as if the original part C had been lost, but the stitches remain; a second set of stitches bind the present part C to part A. Part C on 11582–67 (fig. 23, *j*) has been cut down and on one edge is partly stitched as if a second strip had once been added to part

C, making it higher. On 10241 (fig. 23, *i*) part C has been almost entirely cut away.

Stitches.—Five principal types of stitches were employed. These have been designated stitches 1 to 4, as shown in figure 21, *b*, and a special stitch, Y in the following table, as shown in figure 23, *d*. Figure 23, *e*, illustrates what might be regarded as a sixth form, although it is not truly a stitch. 1 is a simple coiled or hemming stitch which is used for binding together edges placed adjoining in the same plane. 2 is a variant of this in which a cord or sinew passes along the seam under the stitches so as to give them a raised, ornamental effect. 3 is also used where the edges meet, but is always caught through the edges so as to be invisible, and, when pulled tight, makes the seam appear as a wavy line. 4 is a simple in-and-out or basting stitch, used where one edge overlaps the other as on sole patches. Stitch Y (fig. 23, *d*) resembles stitch 3 in that the sinew passes into the edge of the material, but instead of also coming out of the edge, comes out at the top. This allows half of each stitch to show, but, like stitch 3, gives a wavy seam. In the special form shown in figure 23, *e*, the hide is slashed with shallow cuts at short intervals and the sinew passed straight through the hide, just under the surface, producing an ornamental ridge. Sewing is with sinew unless stated otherwise.

Gusset sewing.—The most ornamental and finest sewing is on the gusset, i. e., on the seam between parts A and B. Stitch 1 is definitely known to be used on 83 specimens and probably on 7 others. Stitch 2 is definitely known to be used on 106 specimens and probably on 6 others. Stitch 3 is definitely used on only 1 specimen (10152) and possibly on another (10149). Stitch 4 is never used. On 31 specimens the type of stitch cannot be ascertained. The sewing on the A–B seam is in practically all specimens done with fine sinew, 9 to 18 stitches per inch, and is pulled tight. When stitch 1 is used, the edges of the hide are usually turned slightly upward so as to produce a ridge. In only 9 specimens are these edges turned inward. When stitch 2 is used it is not necessary to turn the hide edges upward or outward as the cord or sinew along the seam forms the ridge.

On a number of the specimens the A–B seam is further ornamented by the addition of quill or basketry material. The most elaborate example is 10241 (fig. 23, *i*), already mentioned for the quill embroidery on the gusset. In this a straight rawhide thong passes along the seam, stitch 2. The sewing is accomplished with a strand of flat basketry material which passes around the thong as a series of half-stitches, 16 per inch (fig. 23, *a*). On 9545 and 10062–1 the A–B seam is first sewed with the regular stitch 2. A quill is then wrapped around the cord which runs along the seam. 11582–59 is similar but basketry material is used. 10265 has basketry material, 9 stitches per

inch, sewed over stitch 2. 11582–18 and 10143 have stitch 2 sewed over cord instead of sinew or rawhide, making the ridge somewhat larger than usual. 10245 is sewed with 2-ply cord.

39 specimens have a secondary stitch (fig. 23, *e*) encircling the gusset about ¼″ out from the seam, A–B. 5 other specimens have two such secondary stitches, spaced ¼″ apart. As a rule, the slashes made to pass these through the hide are close together, 10194, for example, having 22 per inch, and the sinew is pulled tight so as to pucker the toe somewhat. On 10133 (fig. 23, *e*), however, the foundation stitch is looser and a quill is coiled through each stitch to produce an ornamental effect. The A–B seam on this specimen is sewed with stitch 1 and is turned in. On 10131 both secondary stitches are so embroidered.

When part D is present it is sewed to B with stitch 1, which, however, is somewhat coarser than the stitch used on the A–B seam. On those specimens which have a gusset type B but lack part D, the upper edge of B is sewed with stitch 1, but it is not clear whether part D had been present and lost or whether this stitch is merely to finish the edge. Each may be true, for in many specimens the stitch is pulled so tight as to make it seem impossible that it ever was sewed into another piece. On 10114 the B–D seam has stitch Y.

Part C is, in all specimens on which it is or has been present, sewed to part A with stitch 1, excepting 9 specimens on which stitch 2 is used. This sewing is coarser than on the gusset, running from 3 to 5 stitches per inch, showing that less effort was made to ornament the A–C seam. On 9509 (fig. 23, *b*), however, the sinew stitches have an overlay of basketry material, 5 per inch, the sinew sloping one way, the overlay the other way. 10241 (fig. 23, *i*), which has its gusset and A–B seam ornamented, also has the A–C seam stitches similarly overlaid with basketry material or grass. On 11582–32, C is lacking but the upper edge of A is finished with stitch 2 which is continuous with the A–B sewing. 10143, with two sets of stitches along the A–C seam, has already been mentioned. 10136 and 9751 are sewed with 2-ply cord in place of sinew. On 11582–36 the front edge of C is sewed with stitch 1.

Heel.—The heel is usually a perpendicular seam which binds together the edges of A and which has a short cross or T-seam at the bottom, out of which projects a small tab (pl. 7, *c*). The sewing is with stitch 1 in 121 specimens and probably in 3 others. These run 2 to 5 per inch. It is with stitch 2 on only 5 specimens. It is with stitch 3 on only 7 specimens and probably 1 other. It is with stitch 4 on but 3 specimens. It is with stitch Y, which seems to have been designed especially for the heel seam, on 26 specimens. The type of stitch could not be ascertained on 72 specimens.

On 11582–33 both stitches 1 and 3 are used on the heel. 9619 and 10105 are both sewed with 2-ply fiber cord, using stitch 1. 11582–36 has not the T at the bottom of the seam, the tab probably being turned in. 9613 has a double seam; that is, a rectangular insert ¾″ wide is sewed into the heel with stitch 1. 11582–18 has a similar insert sewed with stitch 3. 10068 has a short, V-shaped insert. 9759 has a rectangular insert at the top.

Repair.—The majority of specimens have their soles repaired with whole, half, or heel patches (pl. 7, *d*), which are, with very few exceptions, of buffalo hide from which the hair has been either scraped or worn. 7 specimens are of buffalo hide and 1 is of deer hide with the hair on the outside. Only 58 specimens lack sole repair. That so many moccasins are worn—many are worn beyond repair—is due to the excessively rough and sharp limestone in the vicinity of the caves. 60 moccasins have simply a whole sole; 3 have a whole sole over which both half and heel soles have been added; 1 has a whole sole with additional half sole; 7 have a whole sole with an additional heel sole; 30 definitely, and 2 others probably, have simply half soles; 8 have only heel soles; 32 have both half and heel soles. On 34 specimens the sole repair cannot be ascertained. 4 have special features. 11582–31 has 3 superimposed patches; 11582–18 has 4, 3 of which are superimposed. 11582–6 and 9758 have 2 superimposed half soles and heels. 10115 has a double half sole patch. 11582–67 (fig. 23, *j*, *k*) is repaired with antelope(?) hide, the hooks or dewclaws projecting at the toe.

Approximately ¾ of the moccasins are repaired with stitch 4, about ¼ with stitch 1, 2 only with stitch 3, and none with stitch 2. Sinew is used with few exceptions, for example, 10136 and 10149 which employ 2-ply fiber cord. Occasionally several different stitches are used on the same specimen. For example, 10143 and 9621 have both stitches 1 and 4. The whole sole of 10202 is put on with stitch 1, whereas a patch on the right side of the heel is put on with stitches 1 and 4. The whole sole on 10196 is sewed with stitches 1, 3, and 4, whereas the heel patch is sewed with stitch 4. The whole sole on 11582–65 is sewed with stitch 1 on one side, stitch 4 on the other. The half sole on 9754 has stitches 1 and 4.

A few show repairs in addition to those which mend the wear on the sole. 10152 has slits in the toe and uppers mended with stitch 1. 10143 has a slit in A, just to the left of the gusset, mended with stitch 1.

Lining.—The usual lining is buffalo fur left on the inside of part A. A few have deer or antelope in place of buffalo hide. Instead of, or in addition to, such fur, separate pads of cedar bark, grass, or fur may be used (pl. 7, *a*). Of the total 238 specimens the lining is as follows: 46, buffalo hide; 5, deer or antelope hide; and 2, the hide

of an undetermined species, with the hair turned inside; 55 definitely, and 1 probably, buffalo hair; and 4, deer or antelope hair, turned inside, with an added pad of crumpled cedar bark; 7 buffalo and 1 deer or antelope hair turned inside with an added pad of grass; 1, buffalo hair inside with an added pad of deer or antelope hair; 1, buffalo hair inside with a pad which is probably grass; 1, buffalo hair inside with a pad of juniper bark and deer hair; 1, buffalo hair inside and a pad of coarse black hair, probably buffalo beard or tail; 1, deer or antelope hair inside with a pad of cedar bark and grass; 50 definitely, and 4 more probably, have only a juniper bark pad; 3 have only a juniper bark and hair pad; 4 definitely, and 2 probably, only coarse black hair, probably buffalo tail; 1, pad of cedar bark and deer or antelope hair; 3, only cedar bark and hair pad; 2, only grass; 25 definitely, and 2 more probably, had no lining. On 17 specimens the presence or nature of the lining cannot be determined.

In addition to the specimens listed, 11586 includes 8 moccasin pads, as follows: 2 show buffalo hair turned inside; 1, long black buffalo hair and juniper bark; 1, long black buffalo hair; 4, juniper bark.

TIE.—Of 56 moccasins on which the material used in the tie string can be ascertained, 28 have 2-ply fiber cord which is generally 3/16″ to 3/8″ in diameter; 15 have buckskin thongs; 10 have sinew; 2 have 2-ply cord of juniper bark; 1 has 2-ply grass (?) cord. 2-ply, twisted sinew is used with type 1 tie on 9619. Quill-wrapped sinew is used with type 1 on 10089.

The methods of tying the moccasins fall into three classes, which are, in part at least, correlated with the presence of the upper.

Type 1 (pl. 7, *e;* figs. 21, *c*, *d 1;* 22, *a*) is used with uppers (part C), the middle of the tie cord being passed through a slit in the gusset (part B) or tongue (part B′ or part D), and the ends passing out on each side through holes in the front parts of the uppers. Although the complete tie cord was not present in all instances listed as type 1, many had either fragments of it or holes cut in the tongue for such cords, making it reasonably certain that 56 moccasins used such a tie. All of these have uppers still present or evidence of once having had them. 14 other specimens probably had type 1 ties, all but one of which have uppers or evidence of them. In some of the moccasins, at least, the string must have been wrapped around the ankle, for on one specimen it is 23½″ long and on another (10242) it is 33″ long.

Variations in type 1 are: 11582–43 (fig. 22, *b*), in which the string passes first through holes cut in the corners of part B and then through holes in part C; 11582–67 (fig. 23, *j*), in which it passes through a slit in the right-hand corner instead of the middle

of part B. 10241 (fig. 23, *i*) has the uppers nearly cut away, but the tie string passes through the middle of the tongue.

Type 2 (fig. 21, *d 2*) is used on those specimens which have no uppers, although in some instances there is definite evidence that uppers had been present at one time. The usual procedure was to pass the string through several vertical slits near the upper edge of part A, leaving the free ends at the front, near the gusset, to be tied across the instep. This is definitely used on 20 specimens and probably on 2 others. Of these, only 2 have uppers present and 1 has the upper edge of A plain and unstitched. The remaining 19 specimens have the upper edge of part A stitched, probably indicating that in many of them, at least, after part C had been lost, type 2 tie was used.

Type 3 (fig. 21, *d 3*) is really a modification of type 2, in which the tie string, instead of being laced around the upper edge of part A, merely passes across the instep and has each end run through a single hole near the upper edge of A and knotted so that the end will not pull through. 16 specimens definitely and 10 probably have such a tie, judging either from the presence of the string or of holes cut for the string. On 1 specimen the tie was either type 2 or 3. 10061 may be regarded as a variant of type 3, the ends of the cords being fastened near the heel on each side. 11582–16 also has the cords fastened near the heel, one string being of 2-ply cord, the other a buckskin thong. 9619, on the other hand, has a cord attached to one edge of part A farther forward than is usual in type 3 tie.

On 106 specimens the nature of the tie could not be ascertained, and on 11 specimens which were fairly complete there was no evidence that they had ever had tie strings.

Length.—The length of those specimens which could be measured is, to the nearest half inch: 4½″, 2; 5″, 4; 5½″, 2; 6″, 2; 6½″, 3; 7″, 10; 7½″, 10; 8″, 26; 8½″, 33; 9″, 36; 9½″, 30; 10″, 18; 10½″, 3; 11″, 1; 11½″, 2; 12″, 1. This gives an asymmetrical curve of distribution on account of the inclusion of children's moccasins. The mode is 9″, indicating, probably, that the average adult foot is slightly shorter than that, for some of the space inside the moccasin is generally occupied by padding.

It was impossible and probably would be of little significance to assign moccasins to the right or left foot.

The following symbols are used in the tabular presentation of data on moccasins:

Material.—B, buffalo hide; Z, deer or antelope hide.

Lining.—BHI, buffalo hide with the hair turned inside; ZHI, deer or antelope hide with the hair turned inside; C, juniper bark pad; G, grass pad; H, hair pad; Z, antelope or deer hair pad; O, no lining.

Repairs.—W, whole sole; H, half sole; R, heel sole.

Tie.—Types as shown in figure 21, *d*, that is, 1, 2, 3 or O none.

Heel.—Stitches as shown in figure 21, *b;* Y, like stitch in figure 23, *d.*

Secondary stitch around gusset.—X, present; XX, two such present; O, absent.

Upper.—X, present; F, missing or fragment, but edge of A finished with stitch as if upper had been present; O, lacking the edge of A plain.

S denotes special feature, described elsewhere.

Specimens of moccasins from Cave No. 1

Catalogue No.	Material	Length	Gusset type	Stitch between parts A and B	Secondary toe stitch	Upper	Heel stitch	Type of tie	Repair	Lining
		Inches								
11582-1	B	8	B′	1	O	O	1	O	H	O.
11582-2	B	10	B-D	2	O	X	1	O	W	BHI, C.
11582-3	B	10½	B	2	O	?	1	?	?	BHI.
11582-4	B	?	B-D	2	O	?	?	?	?	BHI, C.
11582-5	B	10¼	B	2	O	?	Y	O	H	?.
11582-6	B	10½	B	2	XX	F	1	?	HRS	BHI.
11582-7	B	?	B′	2	O	XS	1	1	O	C.
11582-8	B	8½	B	2	XS	O	?	2	HR	C.
11582-10	B?	?	?	2	?	?	?	?	H	?.
11582-11	B?	7	B-D?	?	O	F	3	?	H	?.
11582-12	?	?	?	?	?	?	?	?	?	?.
11582-13	?	?	?	?	?	?	?	?	H	?.
11582-14	B?	?	?	2	X	?	?	?	?	?.
11582-15	B	11	?	?	?	?	1	?	R	BHI.
11582-16	Z	6½	B	?	O	O	3	3S	O	ZHI.
11582-17	B	8½	B	2	O	?	1	?	R	BHI.
11582-18	B	9½	B	2S	O	F	3S	3	HRS	BHI.
11582-19	B	9½	B	2	O	F	1	3	W	BHI.
11582-20	B	8½	B′	2	O	O	1	1?	O	BHI.
11582-21	B	9½	B′	?	O	F	1	3	H	O.
11582-22	?	7	B	2	O	F	?	2	H	O.
11582-23	B	4½	B′	2	O	F	2	?	O	BHI.
11582-25	B	8¼	B′	2	O	X	?	1	O	BHI.
11582-26	B	?	?	?	?	F	1	?	?	?.
11582-27	B	?	B	2	O	?	?	?	?	BHI, G.
11582-28	B	?	B	2	XX	?	?	?	?	BHI.
11582-29	B	7½	B-D	?	?	X	?	?	W	BHI.
11582-30	B	?	B	2	O	F	?	?	W	BHI.
11582-31	B	8½	B-D	2	O	O	2	?	HRS	BHI, G.
11582-32	B	11½	B	2	O	F	1	O	W	BHI.
11582-33	B	9	B	2	O	X	1, 3	1?	O	BHI.
11582-34	B?	9	B	2	O	X	1	?	W	C.
11582-35	B	9½	B′	2	O	X	1	1	H	BHI.
11582-36	BS	9	BS	2	O	XS	1S	1?	H	C.
11582-37	B	6½	?	?	?	?	?	1?	W	O.
11582-38	?	?	?	?	?	?	?	?	?	C, Z.
11582-39	B	9	?	2	O	?	1	?	WR	BHI.
11582-40	?	7½	B-D?	2	XX	O?	?	?	HR	O?.
11582-41	B	9½	B′	2	O	XS	?	1	W	BHI.
11582-42	B	?	B′	2	O	F	?	O	O	BHI, C.
11582-43	?	5	B′	1?	O	X	?	1S	O	C.
11582-44	B	8½	B-D?	2	O	F	1	2	R	C.
11582-45	B?	8¼	B	2	O	F	1	2	W	G.
11582-46	?	8½	B	2	O	F	1	O	O	BHI
11582-47	B	8	?	2?	?	?	?	?	?	BHI
11582-48	B	10	B-D	2	O	F	1	O	W	BHI
11582-49	Z	8	B′	2	O	F	1	1	W	O
11582-50	B	9	?	2	O	?	?	?	?	BHI
11582-51	B	8½	B′	2	O	XS	1?	1S	O	BHI, H
11582-52	B	?	?	?	?	?	?	?	?	H
11582-53	B	?	?	2	?	?	?	2	W	C
11582-54	B	?	?	2	?	?	?	?	?	BHI, C
11582-55	B	?	B′	2	O	F	?	1?	O	H, C
11582-55a	B	5¾	B′-b	1	O	F	1	1	O	BHI, G
11582-56	BS	8¾	B	1	O	F	2	O	H, R	BHI, HS
11582-56a	B	?	?	2?	O	X	?	?	W	BHI
11582-57	B	9	B′	2	O	F	?	1	W	BHI
11582-57a	B	10	B′-b	1	O	X	1	1S	WS	BHI, G
11582-58	B	9½	?S	2	O	F	1	?	O	BHI
11582-59	B	8½	B′-b	2S	O	F	1	O	O	BHI, HS
11582-60	B	9	B	2	X	F	?	O	O	O
11582-61	Z?	?	B′-?	2	O	?	?	2?	H	G
11582-62	B	?	?	1	?	?	?	?	H	BHI
11582-63	B	9	B	1?	X	F	1	2	WHR	O

Specimens of moccasins from Cave No. 1—Continued

Catalogue No.	Material	Length	Gusset type	Stitch between parts A and B	Secondary toe stitch	Upper	Heel stitch	Type of tie	Repair	Lining
		Inches								
11582-65	B	7	B′-a	1	O	O	1	3	WS	BHI
11582-66	?	?	?	2	?	F	?	?	W	C
11582-67	B	10	B-D	2	O	XS	1	2, 3?	WS	BHI, G
11582-69	B?	?	?	?	?	?	?	?	?	C
11582-70	B?	?	B′-b	?	?	F	1	1?	?	O
11582-72	B?	9½?	B′-a	1	O	F	1	1	H?	C
11582-73	Z	?	B	2?	O	?	?	?	O	ZHI
11582-74	B	10	B?	2	O	?	?	?	H	BHI, C, Z
11582-75	S	10	B?	2	O	F	1	2	O	?HI
9509	?	?	?	?	?	S	?	?	?	?
9545	B	5½	?	2S	?	F	?	?	O	BHI
9546	B	8	B′-a	2	O	F	1	?	O	BHI, C
9547	Z	?	?	2	?	?	?	?	?	ZHI
9612	B?	10	?	2	O	F	1	?	?	BHI, C
9613	B?	9	B′-c?	1	O	X	1S	1?	O	C, H
9614	B?	10¼	?	2	X	F	1	?	W	BHI, C
9619	Z	8	?	2	O	X	1S	3S	H	C
9620	B	8½	B′-a	2	O	?	1	1	H	BHI, C
9621	B	?	?	1	X	F	?	?	W, RS	C, H
9622	B	8	B′-a	1	O	F	?	1	?	C
9747	B	9½	?	1	X	O	1	3	O	C
9748	B	10	?	1	XX	XS	Y	3?	H	C
9749	B	?	B′-b	1	X	X	Y	1	H, R	C
9750	B	7½	B′-a	1	O	F	1	1	W	BHI, C
9751	B	9¼	?	1	XS	F	1	?	H, R	C
9752	B	9¾	B?	2	O	F	1	?	H	BHI, C
9753	B	8¼	S	0	O	X	4	1	O	BHI, C
9754	B	9½	B′-a	1	O	X	1	1	HS	BHI, C
9755	B	9	B-D	1?	O	XS	Y	?	H, R	BHI, C
9756	B	8	B′-cS	1	X	X	1	1	W	C
9757	B	10	B-D?	2	O	F	1	3?	H, R	BHI, C
9758	B	10	B-D?	1	X	X	?	1	H, RS	BHI, C
9759	B	9	?	1	X	XS	1S	?	H, R	C
9760	B	9½	B′-bS	2	O	X	?	1?	W	O
9764	B	4½	B′-a?	1	O	XS	1	1	O	H
10053	?	?	?	?	?	?	?	?	W	?
10054	?	?	B-D?	2	O	X	1	3	O	O
10055	B	7	B′-a	1	O	XS	1	1	S	H?
10056	B?	8¼	B′-a	2	O	F	1	2	O	O
10057	B?	8	B-D	1	O	XS	1	2	O	O
10058	B	8	B′-b	2	X	XS	1	1	H	BHI
10059	B	9¾	B′-aS	1	O	F	1	1	H, R	BHI, Z
10060	Z	8	B′-a	1	O	F	1	1	H, R	O
10061	Z	8½	B-D	2	O	X	1	3S	H, R	O
10062	B?	8½	B?	?	XS	XS	1	1	O	C
10062-1	B	?	S	S	O	?	?	?	?	BHI, C
10063	B	8½	B-DS	?	O	F	1	2	W, H, R	O
10065	B	5¾	B′-a	1	O	X	2	1	O	C
10066	B?	8½	B-D?	1	O	F	1	3	W	O?
10067	B	9	B′-c	2	O	X	1	?	O	BHI
10068	B	8	B-D	?	O	F	1S	3	W	O
10072	B	9½	B′-c	?	?	?	1	?	H	BHI
10073	Z	9½	B-D	2	O	X	1	3?	W	ZHI
10074	B	?	?	1	?	X	1	?	?	BHI
10075	B	6¾	?	2	O	X	1	?	O	BHI
10082	B	?	?	2	?	?	?	?	?	BHI, G
10083	B	?	B-D?	S	O	F	1	?	W	O
10083-1	B	12	B′-c	2	O	F	?	?	?	BHI
10085	B	9¼	B′-b?	2	O	XS	1	1	W	BHI
10087	B	?	?	?	?	?	?	?	?	BHI
10089	B?	7	B′-b?	2?	O	XS	?	1S	O	H?
10090	B	?	B′-a	1	O	X	?	2	W	BHI
10092	Z	7½	B-D	1	O	XS	1	1?	O	ZHI, C
10093	B	9	?	1	O	F	Y	2	W	H
10102	B?	10	B-D?	1	X	F	Y	3	O	C?
10104	B	9	B′-b?	1	O	X	Y	1	O	BHI. C
10105	B	6¾	B-D	2	O	XS	1S	?	W, R	C
10106	B	7½	B-D	1	X	X	4	1	W	BHI, C
10107	B	7½	?	1	O	XS	1	1	O	H
10108	B	8½	?	2	X	F	1	1	W	C
10109	B	7	B′-a	1	O	F	1?	1	O	BHI, C
10110	B	9	?	?	X	F	Y	2	H	BHI, C
10111	B	8½	B-D	1	X	F	1?	?	H, R	C
10112	B	8	?	1	O	F	1	1	H, R	C
10113	B	?	B-D?	1	X	F	Y	?	H, R	C
10114	B	?	B-D?	1	X	F	?	?	W, R	C
10115	B	9	?	1	X	F	1	?	H, RS	C

Specimens of moccasins from Cave No. 1—Continued

Catalogue No.	Material	Length	Gusset type	Stitch between parts A and B	Secondary toe stitch	Upper	Heel stitch	Type of tie	Repair	Lining
		Inches								
10116	B	8½	B'-b	2	O	X	1	1?	H, R	BHI, C
10117	B	8½	B'-a?	1	O	X	1	1	O	BHI, C
10118	B	9	?	1	X	XS	Y	1	H, R	C
10120	B	9½	?	2	X	?	1	?	O	BHI, C
10121	B	9½	B-D?	1	O	F	1	?	H	C
10122	B	9½	B'-a?	2	O	F	?	?	H, R	BHI, C
10123	B?	9½	B-D?	1	O	?	1	3	W	C
10123-1	B	9½	B-D	1	X	F	?	?	H, R	C
10126	B	9	?	1	O	F	Y	2	W	C
10127	B	9	B-D?	1	O	?	1	2	?	BHI, C
10129	B	5	?	2	O	F	1	2	H	BHI, C
10131	B	10½	B-D?	1	XS	F	1	?	W	G
10130	B	10	B'-a	2	O	F	1	1	O	BHI, C
10132	Z	8	?	2	O	X	1	1	W	C?
10133	B	7	?	1S	XS	F	Y	?	O	C?
10134	B	10	?	1	X	F	Y	3	H, R	BHI?, C
10135	B	8	B-D?	?	X	F	?	3?	H, R	C
10136	B	8½	B-D	1	O	X	Y	1?	H, RS	BHI, C
10137	B?	9½	B'-b	1	O	F	Y	1	O	O
10138	B?	8½	B'-a	2?	O	X	?	?	W	O
10139	B	8	B-D?	2	O	?	Y	?	W	C
10140	Z	9¾	B-D?	2	X	F	3	?	H?	C
10141	B	8½	B'-a	1	O	F	1	1	O	C
10142	?	9¼	B-D	2	O	X	Y	3	O	O
10143	B	8	B'-a	2S	O	XS	Y	1	WS	C
10145	B?	8	B-D	1	O	X	1	1	O	C
10146	Z	?	B-D?	2	O	?	?	?	W	ZHI
10147	B	9½	?	1?	X	F	Y	?	O	C
10148	B	8½	B'-b	1	O	F	Y	1	O	BHI, C
10149	B?	7½	B-D	3?S	XX	F	3	3	WS	?
10150	B	9½	?	1?	X	?	1	3	W, H, R	C
10151	B	9	B-D?	1	O	F	1	2?	H	BHI, C
10152	Z	8½	?	3S	X	X	1	?	S	ZHI, C
10153	B	9¾	B-D	1	O	F	1	2	H, R	BHI, C
10154	B	?	?	2	X	?	?	?	H	BHI
10154-1	B	9	B'-a?	2	O	F	?	?	H	BHI, C
10155	B	?	?	1	O	?	1	3?	W	C
10156	B	9½	B-D	2	O	X	1	?	O	BHI, C
10157	?	9	B-D?S	2S	O	F	1	2?	S	BHI, C
10158	Z	?	B?	2	O	X	1	3?	W	C
10159	B	8	B'-b	2	O	XS	1	1?	O	BHI, G?
10160	B	8½	B-D?	2	O	F	Y	?	R	BHI, C
10160-1	B	9½	B-D?	2	X	F	Y	?	R	BHI
10162	B	9	?	2	O	F	1	?	O	BHI, C
10163	B	?	B'-b	1	O	X	1	1	H	C
10168	B	5	B-D?S	1	O	F	1	?	H, R	BHI, C
10169	B	?	?	1	X	?	?	?	W	BHI, C
10172	B	9	?	?	?	?	?	?	?	BHI, C
10174	B?	9	B-D?	1	O	F	1	?	W, H	BHI, C
10176	B	5½	B'-bS	1	O	XS	1	1	O	BHI, C
10180	?	?	?	?	?	X	1	?	?	?
10181	?	?	?	2	?	?	?	?	?	?
10184	B?	8¼	B'-b	1	O	F	1	1	W	C
10185	B	9¾	B-D?	1	O	F	1	1	H, R	BHI, C
10187	B	8½	B-D?	1	O	F	Y	2	W	BHI, C
10188	B?	7¾	?	1	X	?	1	3?	W	C
10189	B	8	?	?	?	?	?	?	O	BHI, C
10192	B	9	?	2	O	?	1	?	?	BHI
10193	S	8	?	1	?	?	?	?	?	?HI
10194	?	?	B-D	1	XS	?	?	?	?	?
10195	?	8½	?	2	O	?	?	?	W	?
10196	B	9	B'-a	1	O	X	4S	1	W, RS	BHI, C
10197	B	9	?	?	?	?	?	?	H	C
10198	B	8½	?	2	O	?	?	?	?	BHI, C
10199	B	9½	?	?	?	?	?	?	?	BHI, C
10200	B	9¼	B-D	2	O	?	1	3?	W	BHI, C
10240	B	9½	B'	?	X	F	3?	?	W	C
10241	Z	10	S	S	S	XS	S	S	W	ZHI, G
10242	B?	?	B'	1?	O	X	3	1S	W	?
10243	B?	7½	B-D?	1	O	F	1	?	W, R	O
10244	B?	7¾	B'-a	2	O	X	1	1	W	C?
10245	B	8¾	B-D	1S	O	XS	1	1	H	?
10248	B	8½	B	2	O	X	Y	3?	O	C
10249	B	8¾	B-D?	1	O	?	?	?	H, R	BHI
10250	B	9½	B	2?	O	F	1	2	W	BHI
10251	B	11½	B?	2	O	F	1	?	O	BHI, G
10252	B	7½	B-D	1	O	X	1	2	W	?

Specimens of moccasins from Cave No. 1—Continued

Catalogue No.	Material	Length	Gusset type	Stitch between parts A and B	Secondary toe stitch	Upper	Heel stitch	Type of tie	Repair	Lining
		Inches								
10253	B	9	B′-cS	2	O	X	1	1	O	BHI
10256	B	?	B′-b	1?	O	X	?	1	W	O
10257	B	9¾	B-DS	2	O	XS	?	?	H, R	BHI, C
10258	B	?	?	?	?	?	?	?	?	BHI, C
10259	B	10	?	2	O	X	1	1?	H, R	C
10260	Z	8½	B′-?	1	O	F	1	1?	O	C
10261	B	8¾	B′-bS	1	O	F	1	1	W	ZHI, G, C
10262	B	?	B-D	2	O	F	1	?	W	BHI, C
10263	B	9½	B-D?	1	O	?	1	?	H	BHI
10264	B	8	B′-b	1	O	F	1	1	O	BHI
10265	Z	5¾	B?	2S	O	F	2	?	W	ZHI, C
10266	Z	?	?	1	O	?	?	?	?	O
10269	B	9	B′-b	1	O	XS	1	1	W	BHI, C
10270	B	8¾	B-D?	2	O	X	1	?	R	BHI, C
10273	B	?	?	2	O	F	?	?	W	BHI, C
10274	B	?	?	?	?	?	?	?	?	?
10275	B?	5	B′-a	1	O	X	Y	3?	O	BHI
10346	B	9	B-D	2	O	XS	1	?	H	BHI
SPECIMENS FROM CAVE NO. 2										
10070	?	?	?	?	?	F	Y	?	R	O
10202	?	7	B	1	O	O	1	?	W, RS	O

The features of three other specimens, 10069, 10124, and 10345, cannot be ascertained.

Special styles of moccasins.—9753 (fig. 23, *h*), although listed above, is distinguished from the standard style of moccasin by the manner in which the toe is formed. Except for the uppers, it is made of one piece of buffalo hide with the hair turned in. Instead of the usual puckered toe with semicircular insert, a flap, which is continuous with the sole, is folded back over the toe and fastened to parts brought up from the sides of the same piece. It is sewed with 2-ply fiber cord, type 1 stitch, 3 stitches per inch. A second piece of buffalo hide, with the hair inside, forms the uppers, or what corresponds to part C in the standard style. On the left side this is brought across the tongue to which it is sewed for about an inch.

The moccasin is lined with juniper bark. The heel is made by simply folding the hide and sewing the two edges, both of which project out behind, with a crude stitch 4.

An entirely different style (fig. 23, *f*) has some features of a sandal. This specimen (11582–64) is made of a single piece of buffalo (?) hide from which the hair has been removed. The original shape, when cut, was probably oval. A thin strip was then cut off the edge, probably all the way around the circumference, but left attached at the heel (?) end. Next, four slits were cut in the edge on each side and one at the toe end. The thong was then passed through these slits and drawn tight, thus pulling the edges of the hide up around

the foot and stretching the slits into loops. The specimen is now 8¾″ long.

10191 (fig. 23, *g*) has a similar construction, but there are 2 tie thongs which are not attached to the body of the moccasin. This has 5 slits or loops on the right side, 4 on the left side, and 2 at what is probably the toe end. The two loops at the heel end are on opposite sides of a slit, from which a V-shaped piece was probably removed, the edges being drawn together. The two thongs, which are ¼″ to ⅜″ wide, are laced back and forth in complicated fashion and it is difficult to see how the foot was inserted through them. This is 8½″ long, of buffalo hide with the hair turned inside.

3 other specimens are made of buffalo hide of this style but have such heavy, tangled hair projecting from the inside, and are so stiff, that it is impossible to examine them without seriously damaging them. 10086 is 8¾″ long; 10088 is 10″ long; 10246 is of undetermined length.

Comparison with moccasins elsewhere.—The standard Promontory moccasin is quite unlike specimens in Shoshonean collections from the Great Basin, most of which are stiff-soled.[31] Moccasins observed by the writer among Shoshoni of Idaho, northern Utah, and Nevada are either two-piece, having a stiff sole, like those of the Plains, or are of one piece, having the seam along the outside of the foot. The latter, which is a soft moccasin, is also found in the Plateau region. In addition, Plateau peoples sometimes made a soft moccasin which, like the Promontory specimens, had an instep gusset but which also had a seam runnng down the toe.[32] The soft moccasins from California and those found in Lovelock Cave[33] are very unlike the Promontory style and the peculiar Fremont moccasin is unique.[34]

The only account procured from any Shoshoni of a Promontory type moccasin was from a member of the Promontory band of Shoshoni. Although there is no special reason to suppose that this informant was deliberately deceitful, some doubt is cast on his assertion that his people made such moccasins because his statement was made only after the type had been described to him. Excepting this uncertain bit of evidence, the only reports of really close parallels to the Promontory style are from tribes far to the north—the Tlingit, Tahltan, and Tsimshian, where specimens almost identical with those from Promontory have been collected.[35] The latter differ only from those Promontory moccasins which have the tongue separate from

[31] Lowie, 1924, p. 218; Hatt, pp. 180–181.
[32] Hatt, 1916, pp. 163–168, 176–179.
[33] Loud and Harrington, 1929, pp. 47–48.
[34] Morss, 1931, pp. 63–67.
[35] Hatt, 1916, pp. 171–178.

the instep gusset. Other similar moccasins occur to the east among the Naskapi, Montagnais, and several tribes in the region of the Great Lakes and New England. The resemblance of the Promontory specimens to these is particularly marked in those which lack the uppers.

Although these facts do not enable us to trace the origin of this style of moccasin in northern Utah, they do suggest that the Promontory people may have antedated the present Shoshonean tribes by a considerable time and again call to mind the Navaho, who in historic times have revealed no trace of northern culture. The occurrence of mittens in this site points in the same direction. In short, the bison hunters of the Salt Lake region clearly acquired their moccasins and mitten styles from the north.

The single-piece variety of moccasin, described under "Special styles", characterizes no region, although somewhat similar specimens have been collected in widely separated parts of the world. Hatt regards such specimens as possibly derived from sandals woven of vegetable material, such as those found in the prehistoric Southwest, and as ancestral to the moccasins with turned-up soles found in the Southwest and Great Basin.[36] Although the latter type is not represented in the Promontory collection, the special style does have a slight resemblance to sandals.

Cutting Implements

Scrapers.—Scrapers in the Promontory culture are of three rather distinctive types: 1, the end, keeled or "thumbnail" scraper of flint (fig. 28); 2, a flat, thin, retouched slab which is usually of slate (fig. 30, *a–c*, *g*); 3, irregular flakes of flint and obsidian, used with and without retouching the edge.

1. *End scrapers.*—These are most characteristic of the cave culture, but have a wide New World distribution and ancient Old World occurrence. They are made of a thick piece of flint or obsidian which is retouched from one surface only. One end is rounded where it is usually thickest; the other is somewhat tapered and was probably hafted like 11583 (fig. 29).

Specimens from Cave No. 1.—10315 (fig. 28, *a*), gray flint, 1¼″ long. 9741 (fig. 28, *c*), excellent example of end scraper of well-chipped white flint; length, 1¾″; maximum thickness, ⅜″. 9740 (fig. 28, *g*), light gray, translucent flint; length, 1⅜″; maximum thickness, ½″; unusual width, 1⅜″. 9848 (fig. 28, *h*), black obsidian streaked with brown; length, 1 1/16″; maximum thickness, ¼″. 11569 (fig. 28, *j*), white flint; length, 1⅜″; maximum thickness, 7/16″; also a fragment of what is probably an end scraper of obsidian.

The most interesting specimen of this type is 11583 from Cave No. 1 (fig. 29). A broken and entirely unworked fragment, 4⅜″ long, of the rib of a large mam-

[36] p. 197.

nal serves as handle. A piece of white flint is lashed to the end of this by several turns of a rawhide thong 3/8" wide. The flint is broken but the general proportions of the remaining fragment are those of an end scraper rather than of a knife.

Specimens from Cave No. 2.—These are considered below under "Stratification of Cave No. 2."

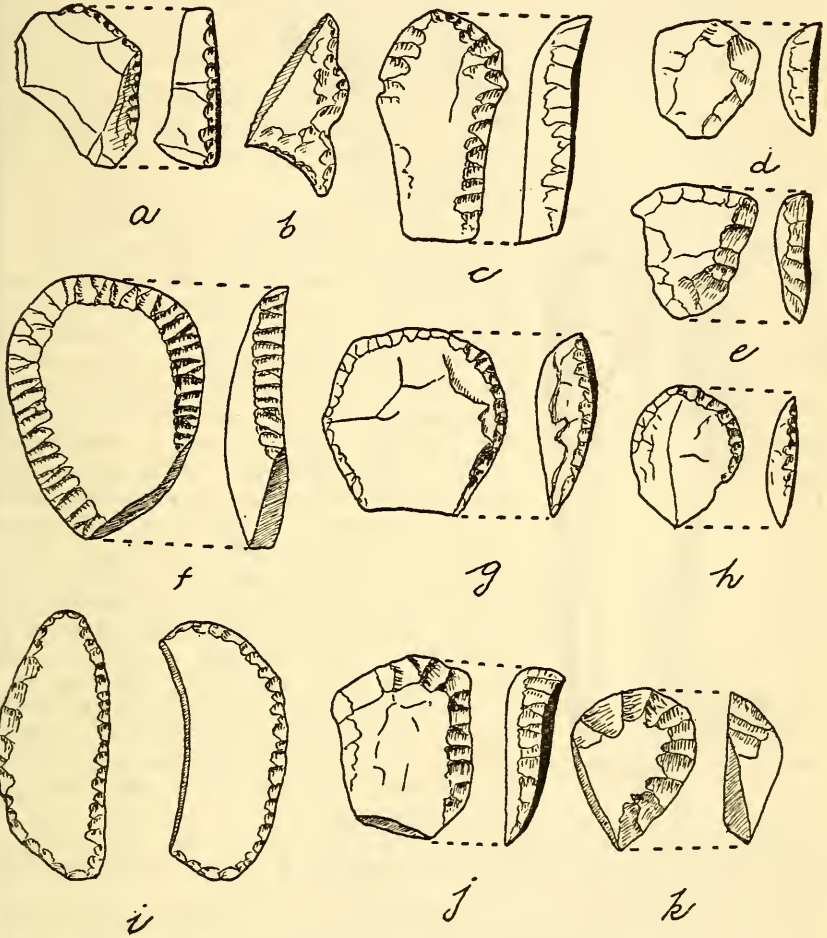


FIGURE 28.—Stone scrapers of the Promontory culture.

Specimens from Cave No. 7.—10834 (fig. 28, *f*), excellent example of an end scraper; butt end broken; length, 2"; maximum thickness, 1/2"; gray flint. This was associated with arrow points and pottery (10833) of the Promontory cave type.

Specimens from Cave No. 11.—11521 (fig. 28, *d*), obsidian; length, 7/8"; maximum thickness, 1/4". 11521 (another, fig. 28, *k*), obsidian; butt end broken; length, 1 1/4"; maximum width, 7/16". Also fragments of 2 other obsidian end scrapers. These were associated with a potsherd (11519) that resembles the Promontory cave pottery except for its lack of the characteristic coarse white temper.

2. *Slate scrapers or knives.*—These are made of thin slabs, ⅛″ ⅜″ thick, which were broken from native rock or boulders so as t be the desired thickness, for they are never made thinner by chi ping. Most are slate; occasionally other material is used, but pro ably slate was preferred because of the ease of making it the d sired thickness. Some are pointed at one end (fig. 30, *a–c*); son are ovoid (fig. 30, *b*); some are very irregular in outline. The edg are retouched in part or in whole, from both surfaces, so as to somewhat sharp but very rough and irreg lar. It is impossible to say whether th retouching was accomplished by pressu or battering.

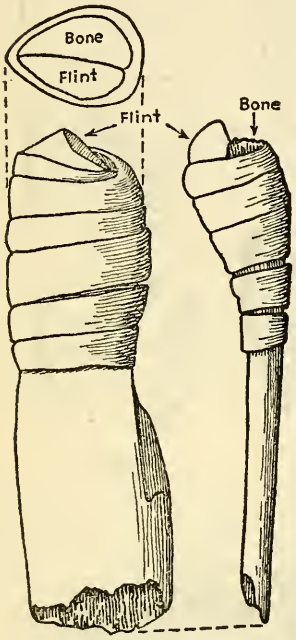


FIGURE 29.—Broken hafted flint scraper.

Specimens from Cave No. 1.—10606 (fig. 30, 7 slate; length, 3½″; thickness, 5/16″; edges touched except ends which are broken squa 11569 (fig. 30, *c*), slate; length, 2½″; thickne ⅛″ to 3/16″; edges retouched except base whi is broken square. 11572 (fig. 30, *g*), nephrite greenish, hard, semiprecious stone somewhat sembling turquoise); length, 2⅜″; thickne 5/16″; one edge retouched; others broken squa 11553–6, slate; length, 5⅞″; little retouched, edges are naturally sharp; very irregular sha traces of red paint on one side. 11553–7, th brown slate slab; roughly triangular; leng 3½″; one long edge retouched. 11573–3, roug circular slate slab; diameter, 3″; thickness, to ⅜″; edges on opposite sides retouched about 2½″. 10530, roughly rectangular sc slab; length, 3¼″; width, 2½″; thickness, ⅜ 3 edges retouched and show wear; 1 edge bro square. 10528 is roughly semicircular, of bro flint, probably made from a thin vein of fli curved edge is retouched from both surfac other edge broken.

Specimen from Cave No. 4.—10874 (fig. 30, *a*) is of crude chert, proba from a thin natural vein; length, 3½″; thickness, ⅜″; edge entirely retouc except at break on butt.

Specimen from Cave No. 5.—11523, more or less circular slab of calc from vein 3/16″ thick; diameter, 4″; edge practically all way around retouc and shows wear.

3. *Retouched flakes of obsidian and flint.*—These are irregu flakes, used as they are when struck off the core, without shapi but with one or more edges sharpened by slight retouching.

Specimens from Cave No. 1.—11152 (fig. 28, *b*), of obsidian; length, 1⅜″; side broken. 11569 (fig. 28, *i*), 2 more or less oval flakes of thin flint, each long; edges retouched from one surface only all way around; one specimen l one edge broken. 10529, crude flakes of quartzite, ⅜″ to ½″ thick; leng 3½″; one edge slightly retouched. 10327, slightly retouched flake of bro flint.

Specimens from Cave No. 3.—11547 (fig. 31, *g*), leaf-shaped flake of gray quartzite; length, 2 3/16″; maximum thickness, ¼″; entire edge retouched from one surface only. 11548, 2 somewhat retouched flakes of obsidian.

Specimen from Cave No. 11.—11521, obsidian; length, 2″; width, 1⅜″; edges retouched from both surfaces and worn.

A number of flakes of flint, obsidian, and quartzite are not retouched but show wear on their naturally sharp edges. Specimens from Cave No. 1 are: 10285, small flake of white flint, 1½″ long. 11553–5, thin flake from outside of water-worn pebble of slate; length, 2¾″. 9511, thin flake of bluish flint; length, 2⅝″. 736, fragment from water-worn boulder of greenish schist; thickness, 5/16″; length, 3¼″. 10562, small white flint flakes. 11569, thin flake of gray flint, 3¼″ long; also obsidian flake, ⅛″ thick, 1¾″ long.

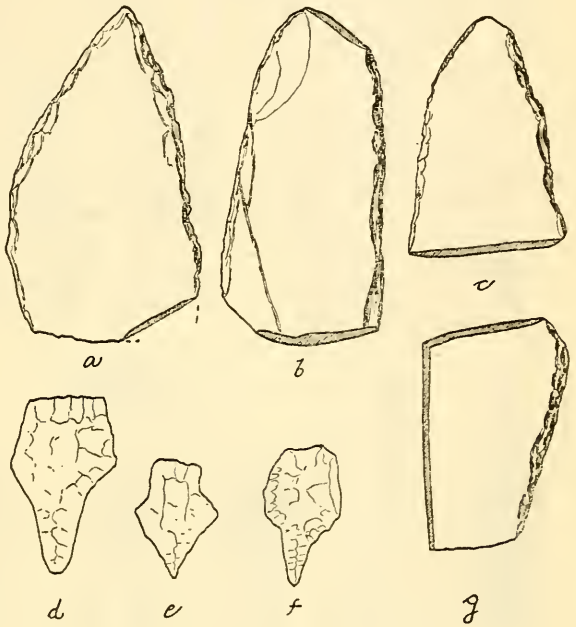


FIGURE 30.—Slate blades and chipped flint points.

DRILLS.—Three specimens of flint drills have squarish butts and tapered but not very sharp points. These were probably hafted in the ends of shafts.

Specimens from Cave No. 1.—11568 (fig. 30, *d*) is of dark-brown flint, 1⅞″ long, ¼″ thick; ¾″ of the butt is rectangular; the point is quite blunt. This may have been secondarily used as a knife. 10390 (fig. 30, *c*) is of white flint, ⅝″ long, 3/16″ thick. Its butt is rectangular, but flares into definite shoulders ⅛″ wide from which the relatively sharp point tapers.

11546 (fig. 30, *f*), from Cave No. 3, is of white flint, 1½″ long. The butt is rectangular, 1″ long; the point is slender and tapering, ½″ long.

KNIVES.—Six specimens of wooden knife handles were recovered from Cave No. 1 (fig. 32). Although none of these contained flint flakes, several of the blades shown in figure 31 fit nicely (pl. 6, *j*). Mr. Charles Kelly found a complete knife in Cave No. 1, with a blade and handle corresponding with those described herein, indicating that the blades in figure 31 were probably hafted in handles like these.

Five wooden handles (fig. 32, *a–e*) are long and slender, ranging from 4⅛″ to 4¾″ in length, with a notch at the upper end in which the blade was set so as to project straight forward, and held with some sort of glue. Only one shows evidence of wrapping with sinew or other material. The wood, probably cottonwood, is carefully cut and fairly well smoothed. Two specimens (fig. 32, *c*, *d*) have notches on opposite sides of the lower ends of the butts as if for tying on a cord. Two others (fig. 32, *b*, *e*) were used as hearths of fire outfits as well as knife handles. The sixth specimen (fig. 32, *f*) is slightly longer than the others, 5½″, and differs from them in that the stone blade was set at an angle in the side of the end.

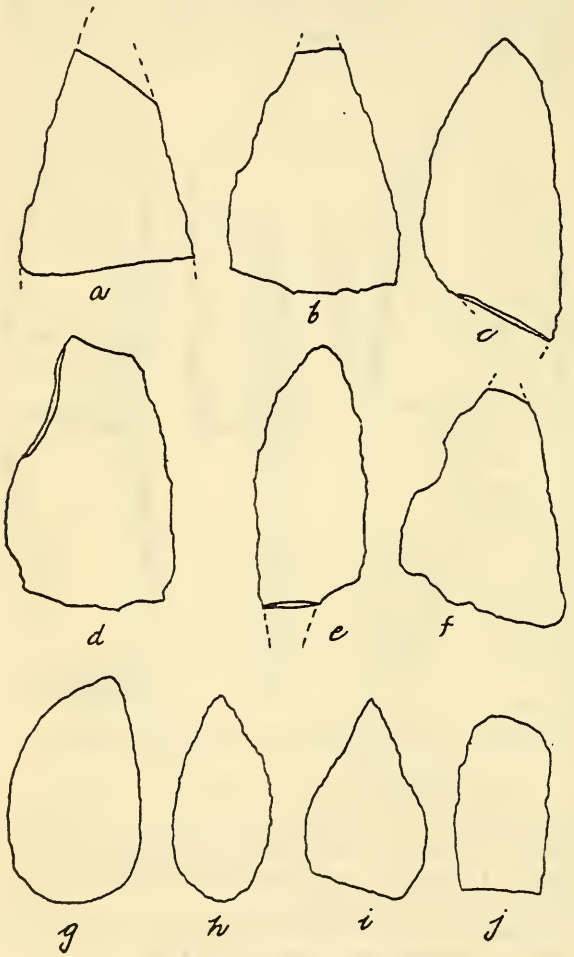


FIGURE 31.—Chipped flint knives.

The stone blades (fig. 31) are generally triangular, although the bases are diagonal and do not make the triangles isosceles. They are of fairly well chipped flint and range in length from 1⅞″ to 2⅞″.

Specimens of handles.—11533–2 (fig. 32, *a*), highly polished cottonwood; length, 4⅛″; average width, ⅝″; average thickness, 7/16″; notch thickness at top, 3/16″; at base, ⅛″; notch depth, 7/16″; notch contains some glue and traces of hair; outside of handle around notch also coated with glue. 9697 (fig. 32, *b*), length, 4⅛″; average width, 5/16″; average thickness, 11/16″; notch width at top, ¼″; at bottom, 1/16″; bottom of notch runs diagonally; notch depth on left side, ⅞″; on right side, 9/16″; bottom of notch filled for 5/16″ with glue; handle has two pits for fire drill, one 1″, the other 1⅞″ from the butt; these are fire-blackened and are 7/16″ and ⅜″ in diameter; below each pit a slight V-notch is cut in the edge of the handle so that it cuts partly into the pit. 11533–3 (fig. 32, *c*), length, 4¼″; width at notched end, 1⅛″; width

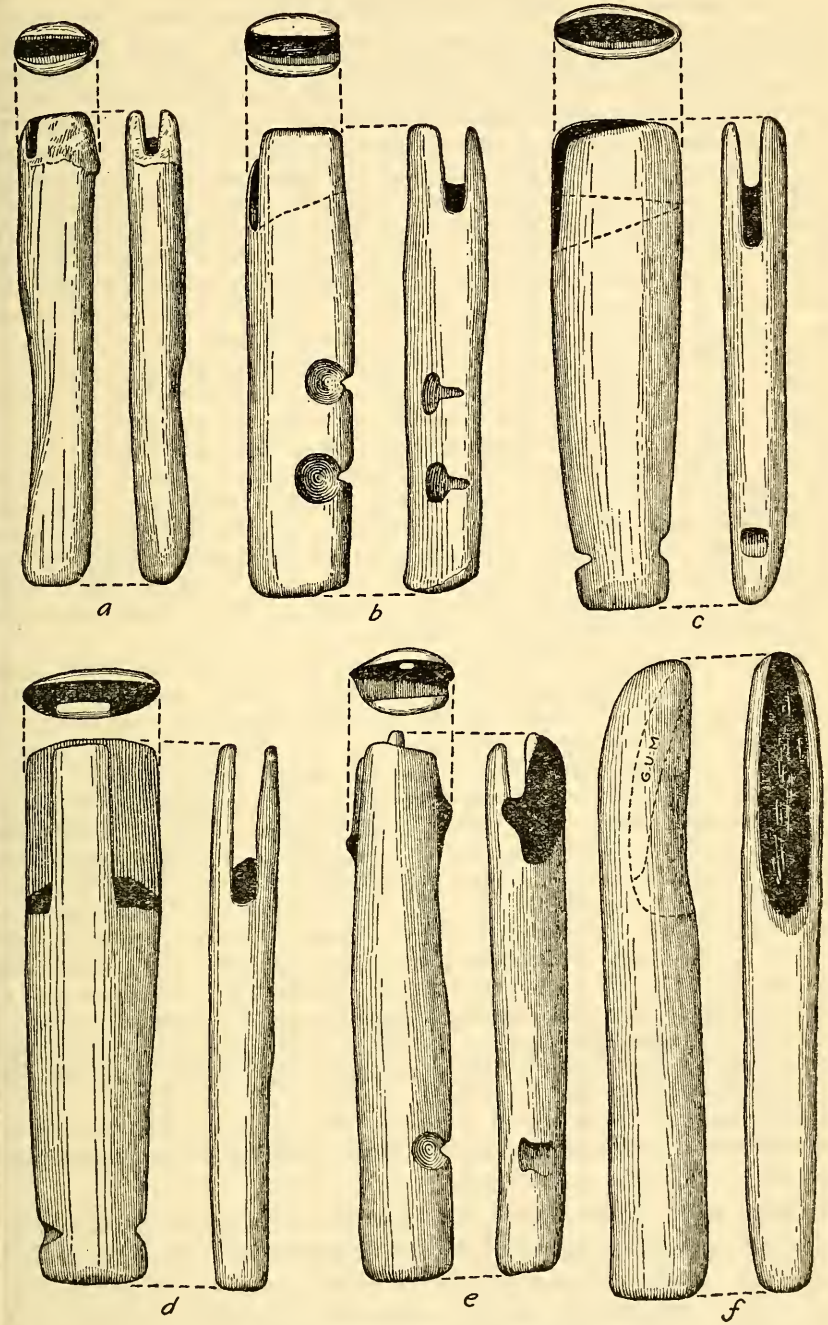


FIGURE 32.—Wooden knife handles.

at butt end, ¾″; average thickness, 9/16″; width of middle of notch at top, 5/16″; of ends of notch at top, 1/16″; width of bottom of notch, 1/16″; bottom of notch slopes, being 1/8″ deep at left side, ½″ deep at right, but is filled with glue so as to be level across bottom, ½″ deep; exterior of blade end shows scratches in wood from shaping of handle, also slight evidence of glue and wrapping; butt has notches on opposite edges, ½″ from end, probably for fastening a string or thong. 11533–1 (fig. 32, *d*), probably cottonwood; length, 4¾″; width at notched or blade end, 1 3/16″, at handle end, 1 5/16″; average thickness, 9/16″; notch is enclosed by width of handle on one side but only by a tongue of wood 9/16″ wide on other side; notch depth, 1½″; notch width at top, ¼″; at bottom, 3/16″; bottom of notch filled ½″ deep with glue; back of handle also bears traces of glue and of wrapping as far down handle as notch extends; butt of handle has shallow notches on opposite edges ⅜″ from end for fastening string or cord. 10365 (fig. 32, *e*), length, 4 11/16″; width at blade end, 9/16″; in middle and at butt end, 13/16″; average thickness, 11/16″; notch depth, ½″; notch width cut in handle, ⅜″; one side of notch filled with glue holding small peg, 1/8″ in diameter, as wedge, leaving actual width in which blade lay 5/32″; glue also on outside of handle around notch; handle has one pit for fire drill, 1⅛″ from butt; this is 5/16″ diameter; a V-notch in the edge of handle below pit cuts slightly into it. 11602–1 (fig. 32, *f*), unusually well smoothed and polished; length, 5 9/16″; average width, ⅞″; average thickness, ⅝″; notch or groove for blade is cut in edge of handle at one end; notch length, 2⅜″; notch width at ends, ⅜″; in middle, 7/16″; notch depth lower end, ½″, sloping to surface at other end; notch largely filled with glue as indicated by broken lines in drawing.

Specimens of stone knife blades from Cave No. 1.—9715 (fig. 31, *b*), dark gray flint; well chipped; length, 2 5/16″; point is broken; base width, 1⅝″; thickness, ¼″ to 5/16″. 10584 (fig. 31, *a*), brown quartzite; present length, 2⅛″; point and butt broken off; thickness, ¼″. 9710 (fig. 31, *c*), pinkish flint; well chipped; edges finely retouched, showing wear; present length, 2⅞″; butt broken but probably was diagonal, for setting in handle with either a notch having a diagonal base or with a notch on the side of the handle like figure 32, *f;* width, 1 5/16″; thickness, ¼″. 9735 (fig. 31, *d*), light flint; length, 2½″; tip and side near tip broken; width, 1 9/16″; thickness, ¼″. 9714 (fig. 31, *f*), burned flint; length, 2¼″; width, 1½″; thickness, ¼″; base diagonal. 11568–1 (fig. 31, *h*), obsidian; length, 2″; maximum width, ⅞″; thickness, 3/16″ to ¼″; base rounded. 11568–3 (fig. 31, *i*), gray quartzite like the material used on the Black Rock Cave dart points; length, 1⅞″; maximum width, 1 3/16″; thickness, ¼″; base somewhat diagonal. 11564 (fig. 31, *j*), obsidian; length, 1⅝″; width, ⅞″; thickness, 3/16″ to ¼″; one end rounded; other end broken square across. 11569, pinkish flint; length, 1¾″; width, 1⅜″; one end broken; other end rounded.

10773, from Cave No. 4 (fig. 31, *e*), bluish flint; present length, 2½″; butt now broken but had been diagonal like 9710; thickness, 3/16″; workmanship good.

Several other pieces of chipped flint from Cave No. 1 are so extremely crude and irregular that it is unlikely that they were hafted as knives. 11569 includes a piece of bluish gray chert, 3¾″ long, 1¾″ wide, irregularly chipped somewhat after the fashion of a coup-de-poign. 9564 is a similar piece, 2¾″ long, of dull bluish flint. 10326 is a fragment of a similar piece. These may have been crude scrapers or choppers, or simply rejects.

Other Objects of Stone

Etched stones.—Caves Nos. 1 and 3 yielded a number of small, crude, unshaped slabs of slate on which are etched or scratched geometric designs. These designs, which are so faint as almost to escape detection, are formed almost entirely of straight lines, bands, triangles, and chevrons filled with finer parallel lines or crosshatching. The nature of the designs gives no clue to their meaning or purpose, nor does their occurrence, for all were found scattered in the rubbish on the cave floors.

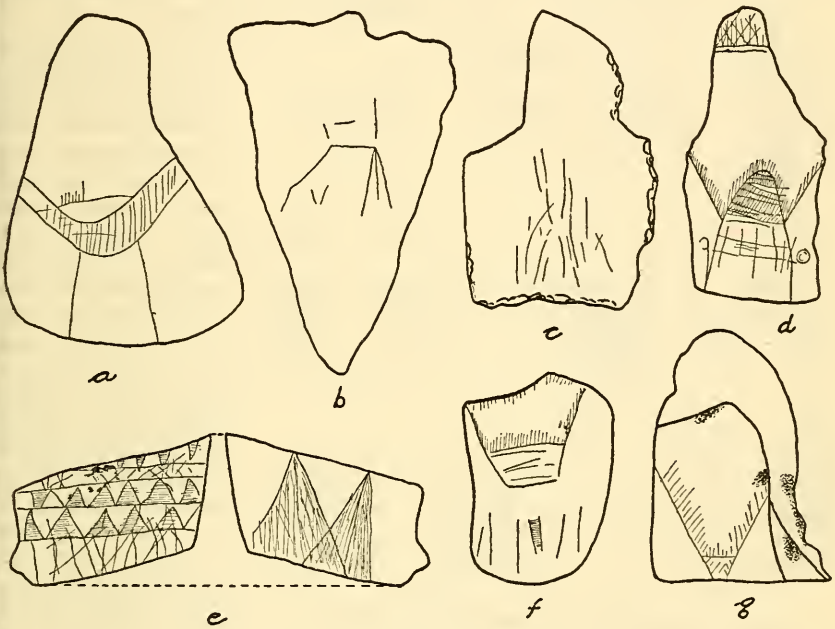


Figure 33.—Etched slabs of slate.

Similar slabs are reported by Mr. Charles Kelly, of Salt Lake City, to occur in considerable number on the surface of the ground near Little Mountain, west of Ogden, Utah. Others are said to be associated with the Promontory type of pottery in a cave at Lakeside on the western side of Great Salt Lake. Mr. Alfred E. Bruerton, of Ogden, Utah, has kindly supplied illustrations and information of eight limestone slabs from caves near Blue Creek, a station on the old Southern Pacific line at the northern end of Promontory point.

Specimens from Cave No. 1.—11553–2 (figure 33, *a*), length, 4 1/16″; thin slab broken from a water-worn pebble; design is a band 3/8″ to 7/16″ wide, forming an inverted chevron across the slab. This is filled with vertical parallel hatching; two lines 7/8″ apart descend from this to the lower edge of the slab; lines very faint. 11553–1 (fig. 33, *f*), thin slab, 3 5/8″ long; upper line is inverted trapezoid, divided by a horizontal line into two parts; enclosing

lines of upper part are fringed inside with fine vertical lines; lower par filled in with several irregular horizontal scratches; below the trapezoid ar irregularly placed vertical lines; horizontal scratches fill in part of the spac between two of these near the center. 11553–4 (fig. 33, *g*), thin slab fron pebble with irregular surface; 3⅛″ long; lower part of surface decorated with diagonal lines which nearly converge at bottom edge; short, fine scratches run upward from these, fringe-like; a short horizontal line near the bottom edge, connecting the diagonal lines, is similarly fringed; slab also has spots of red paint. 11553–3 (fig. 33, *c*), slab, 3⅝″ long, with edge retouched as knife or scraper; one surface bears irregular vertical scratches which do not form a design.

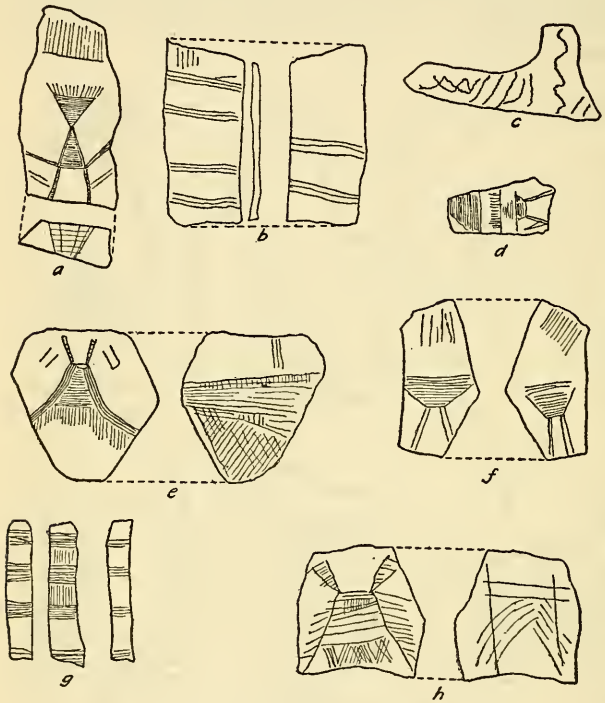


FIGURE 34.—Incised and etched limestone slabs.

Specimens from Cave No. 3.—11573–1 (fig. 33, *d*), slab, 3⅝″ long, ½″ thick; point at upper end decorated with band ½″ wide, filled in with diagonal and vertical cross-hatching; lower half has fringed line enclosing semioval area, with its base on lower edge; a diagonal fringed line runs to each edge from the sides of this; upper end of the area has eleven irregular horizontal lines, the spaces between some of which are filled with diagonal parallel hatching; several more vertical and horizontal lines occur below this; near each edge of the slab, outside the semioval area, are small circles. 11573–2 (fig. 33, *c*, shows the obverse and reverse sides), slab, 2⅝″ long, ¼″ thick; obverse decorated with three horizontal rows of triangles, each filled with parallel lines; top row has four triangles with their apexes down; next row, blank; third row, six triangles with apexes of all but one up; fourth row has 5 triangles with apexes up; below this are irregularly placed vertical and diagonal lines; reverse has two large triangles with their bases somewhat intersecting and resting on the lower edge, their apexes on the upper edge of the slab; these are filled with finer vertical scratches; the right-hand triangle is also bisected with a heavier line. 11573–4 (fig. 33, *b*), slab, 4⅜″ long, ⅛″ to ¼″ thick; long edges retouched for knife or scraper; one side bears several straight lines forming a design which somewhat resembles a tent.

Specimens from the limestone caves near Blue Creek Station (fig. 34), all found in the backs of the caves. These are fire-stained and bear finely scratched lines, except figure 34, *c*, which Mr. Bruerton

tates was made with a point which was "wiggled in the manner an engraver sometimes uses his tools." Figure 34, *a*, length, 4″, thickness, ¾″; decorated on one side and end. Figure 34, *b*, length, 3½″, thickness, ¼″; decorated on both sides. Figure 34, *c*, length, 4″; decorated on one side. Figure 34, *d*, length, 3¼″; decorated on one side. Figure 34, *e*, length, 3″, thickness, ⅜″; decorated on both sides. Figure 34, *f*, length, 3¼″; cross section approximately ½″ square; decorated on three sides. Figure 34, *h*, length, 2¾″; decorated on both sides.

A pencil-shaped object of polished black slate (10873, fig. 35) from Cave No. 4 is 2⅝″ long and $^{9}/_{32}$″ in diameter in the middle, and tapers to a blunt point at one end and to a butt $^{7}/_{32}$″ in diameter at the other end. The butt end is drilled for ⅝″ with a hole $^{5}/_{32}$″ in diameter, suggesting that the object may have been placed on the end of a stick. Short transverse scratches are irregularly placed around the butt for ¾″. Two heavier longitudinal lines beyond these branch into finer lines and look like small trees stripped of their leaves. Between and on each side of these "trees" are rows of short transverse scratches. No meaning can be ascribed to the decoration nor use to the object.

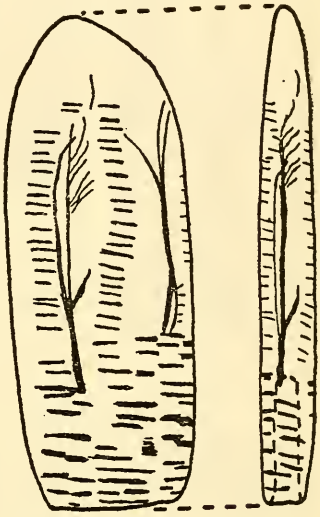


FIGURE 35.—Slate point from Cave No. 4.

A decorated pebble, 11585–1, from Cave No. 1 is formed of one-half of a small spherical water-worn quartzite pebble. The flat or broken surface is 1¼″ by ⅞″ in diameter; the semispherical surface is ¾″ tall. It is decorated around the edge, above the broken face, with 17 more or less evenly spaced vertical marks which are about the color and size of pencil marks.

HAMMER STONES.—No shaped or hafted mauls, hammers, or axes were found. Hammering and pounding was accomplished with natural rocks of convenient size.

Specimens from Cave No. 1.—9737, small elongated water-worn limestone pebble; one end battered; other end broken. 9739, water-worn limestone pebble, 6¼″ long, 3½″ wide, 2″ thick; each end battered.

Specimens from Cave No. 2.—10070, like 9739; 3¼″ long, 2⅛″ wide, 1¼″ thick; each end battered. 10071 like 10070.

Specimens from Cave No. 3.—11545–1, like 9739; 3¾″ long; each end battered. 11545–2, like 9739; 3⅝″ long; each end battered.

MULLERS.—The only implements for seed grinding are several mullers. No mortars or pestles, nor, indeed, even metates were discovered.

Specimens from Cave No. 1.—The finest muller or mano is of serpentine (9738, fig. 36, *a*). It is 10½″ long, 2$^{9}/_{16}$″ maximum width, 1$^{1}/_{16}$″ thick. Although it is well smoothed all over, most of the grinding seems to have been done on the lower surface (indicated by heavy line in cross-section diagram) which is divided into two parts: one, the main rubbing surface which is 2½″ wide; the other, a narrower surface, ⅝″ wide, which forms an angle of about 150° with the first. One end of the muller is rounded and shows no evidence of use as a hammer or pestle; the other end is broken. 10577 (fig. 36, *c*) is quite unlike the last, being short and wide, and of rough, coarse-grained quartzite. It is 6⅞″ long, 4¼″ wide, and 2″ maximum thickness. Fractures along the sides point to hammering as the initial step in shaping it; pecking (not battering in use as a hammer) was employed for further shaping; but it was used before it had been worked to final form, for opposite faces, which are not quite parallel, were used for grinding. 9512 (fig. 36, *e*) is the end of a muller made of gneiss, 3″ long, 2½″ wide, 1½″ thick. This was partly shaped by pecking, much evidence of which remains. It has opposite parallel grinding surfaces and bears smudges of red paint, especially on the bottom.

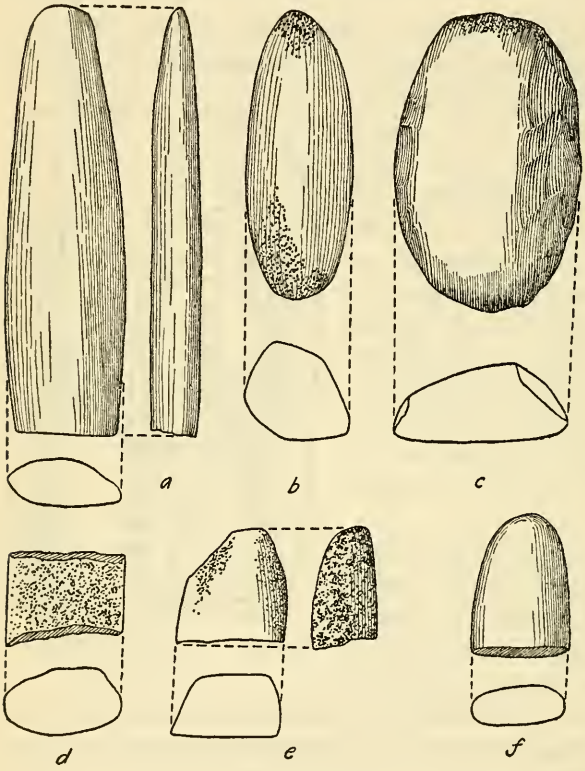


FIGURE 36.—Stone mullers.

Specimen from Cave No. 5.—11525 (fig. 36, *b*) is a good example of a complete muller of gneiss. It is 6⅞″ long and more or less egg-shaped in cross section, having three distinct grinding surfaces. Both ends are pitted from pecking.

PIPE.—A single tubular pipe (11559, fig. 5, *c*) was found in Cave No. 1. It is of dark steatite and bears a high polish but no decoration. Slight longitudinal striations remain from scraping during its manufacture. It is 4″ long, ⅝″ in diameter at the bowl opening, ¾″ maximum bowl diameter which is about 1¼″ back from the bowl opening, and tapers back to ¼″ diameter at the mouth end. The inside of the pipe has been worked down with some instrument, which has left scratches running lengthwise, so that the walls of the

bowl are only $\frac{3}{32}''$ thick. The walls are beveled at the open end of the bowl to a sharp edge. The hole at the mouth end is approximately $\frac{3}{32}''$ in diameter. There is no evidence of the use of a separate mouthpiece or stem. The interior bears a slight incrustation, probably of tobacco.

Miscellaneous stone objects.—Cave No. 1 yielded several fragments of paint or rock to be used as paint. 10517 is a small lump of red paint. 9511 and 10438 are lumps of a reddish mineral which were no doubt brought in to be made into paint.

Fragments of rock foreign to the formation of Cave No. 1 were a plain water-worn limestone pebble about $\frac{3}{4}''$ in diameter (11585–2) and a circular water-worn pebble (10302) $\frac{15}{16}''$ in diameter, $\frac{1}{2}''$ thick. These originated in nearby beach gravels.

A lump of asphalt (10502), found near the surface in Cave No. 2, came, in all probability, from the deposits on the northern shore of Great Salt Lake just west of Promontory Point, about 30 miles from the caves.

Flora and Fauna Represented

Specimens of animal remains from the upper levels or pottery culture period of the Promontory caves included bones, horn, hide, fur, and feathers. Some of these could not be identified with certainty. As these bones were not selected at random, the proportion of different species is not necessarily that represented in the cave. Miss Edna Fisher, of the Museum of Vertebrate Zoology of the University of California, has assigned these to the following species:

Bison bison bison (Linnaeus), plains buffalo or bison, probably 30 specimens.

Antilocapra americana americana (Ord.), pronghorn antelope, probably 33 specimens.

Lepus sp., rabbit, probably 5 specimens.

Canis nubilus Say. (*Canis mexicanus nubilus*), plains wolf, probably 3 specimens.

Erthizon epixanthum subsp., porcupine, 1 specimen.

Lynx sp., bobcat, 1 specimen.

Felis domesticus, common house cat, 1 specimen; probably wandered in from Sheehan's ranch.

Bubo virginianus (Gmelin), great horned owl, probably 4 specimens.

Æchmophorus occidentalis (Lawrence), western grebe, probably 1 specimen.

Cathartes aura, turkey buzzard or vulture, probably 10 specimens.

In addition to these, there are probably species of geese, gulls, and pelicans. Two specimens are small dried lizards.

Tentative identification of another batch of bones from the upper levels of the Promontory caves was made by Mr. O. Whitney Young, of the Department of Zoology, University of Utah. These give probable species as follows:

Elk, 6 specimens.

Antelope, 35 specimens.

Deer, 25 specimens.
Buffalo, 15 specimens.
Rabbit, 8 specimens.
Goat, 2 specimens. In recent times sheep and goat herds have wandered over this region.
Dog or coyote, 1 specimen.
Dog (very immature), probably 1 specimen.
Wild cat, 1 specimen.
Bovine, 2 specimens.

Identifications of plant materials used in artifacts made by Dr. Walter P. Cottam, of the Department of Botany, University of Utah, are as follows:

Celtis reticulata(?), hackberry.
Phragmites communis, reed.
Sarcobatus vermiculatus, greasewood.
Chrysothamnus sp.(?), rabbit brush.
Sambucus glauca, elderberry.
Scirpus americanus, tule.
Scirpus validus, tule.
Sambucus sp., elberberry.
Salix sp., willow.
Salix exigua, willow.
Juniperus utahensis, juniper; locally called cedar.
Populus sp., cottonwood.
Betula fontinalis, birch.
Acer grandidentatum, maple.

Cultural Position of Cave No. 1

A determination of the chronological and cultural position of the culture in Cave No. 1, which we have called the Promontory culture, may be undertaken through stratigraphy or by a comparison of the artifacts with specimens from other known cultures.

Stratigraphy as an age criterion is of less value than might be expected, because although Basket Maker style pictographs occur in Cave No. 1, no artifacts of Basket Maker or other recognized culture complexes are represented in any of the sites bearing the Promontory culture. The most that can be said is that in every one of 12 caves the Promontory culture occurred in the uppermost stratum but that nowhere were post-Caucasian artifacts associated with it. The cultures stratigraphically under it in the caves seem, on the basis of the implements of stone and bone, to be somewhat simpler but cannot be positively related to any known cultures. This point, however, will be discussed more fully below.

A comparison of artifacts with specimens from other cultures throws more light on the problem of chronology. The earliest Southwestern culture known in the Great Salt Lake region is one of a puebloan, pit-lodge people and is entirely unlike the Promontory

culture. The former has horticulture (corn and squash), clay figurines, metates, gaming bones, and pottery of distinctive though definitely puebloan styles, and several other features[37] which the latter lacks. For this reason the Promontory culture must be either earlier or later than this. That it is earlier is at once ruled out, for it is clearly not pure Basket Maker. The Promontory pottery is totally unlike any known Basket Maker ware and does not include any of the Basket Maker features found in the pottery of the Northern Periphery.[38] Moreover, as has been shown elsewhere, there is no other evidence of a pure Basket Maker culture in the Great Salt Lake region, or indeed, in the greater part of the Northern Periphery.

The use of the bow and arrow, which is abundantly proved in Cave No. 1 and elsewhere, requires the same conclusion. The bow was not introduced into the Southwest until toward the close of the Basket Maker period. It is very unlikely that there was around Great Salt Lake a culture which was earlier than Basket Maker and which possessed pottery and the bow, or which was contemporary with but totally unlike the Basket Maker. Moreover, even the sinew-backed bow, which is later in America than the self-bow, is represented in Cave No. 1.

These facts, together with the culture's uppermost position in all known sites, show it to be post-Pueblo, that is, to have existed some time after about 1000 A. D. or a trifle earlier, when the puebloan cultures vanished from northern Utah, and before the white man came into the Great Basin about 100 years ago. It is possible, though unlikely, that the Promontory people occupied the caves during this entire time.

The relationship of the Promontory culture to recent Indian cultures is impossible to establish. The Promontory culture existed in a region recently occupied by the Shoshoni, but its correspondence to Shoshoni culture is far from complete. In contrast to the Shoshoni, who were essentially seed gatherers using a highly developed complex of twined basketry, the Promontory people seem to have been primarily hunters, leaving great numbers of the bones of large animals and numerous scraps of hide but no twined basketry in the caves. In explanation of this fact, however, it must be remembered that bison were very numerous in northern Utah prior to 1832. The relationship of the Promontory culture to modern cultures is further confused by the presence of certain southwestern as well as far northern traits. The following comparisons will serve to demonstrate the far-flung connections of the Promontory culture.

[37] Steward, 1933 b, 1936; Judd, 1926.
[38] Steward, 1933 b; Morss, 1931.

Traits of probable northern origin are: the style of moccasins and mittens (far north; Lemhi Shoshoni made such mittens); the sinew-back bow (also found throughout the Great Basin); the type of hand-game bone (Plains; in the western Great Basin and California, these are bone tubes);[39] the end scraper (especially Plains but widely spread and also found in earlier deposits in the Salt Lake region); possibly beaver-teeth dice (Puget Sound).

Traits of probable ultimate southern origin are: pottery (southwestern; it is possible, however, that this came from the Plains to the Promontory culture); the tubular pipe; cedar-bark rings, which are probably pot rests (Pueblo); possibly wooden tubes for the hidden-ball game (Pueblo); bird-bone beads (Basket Maker and Pueblo); pottery disks; possibly cane dice.

The comparison of the Promontory culture with that of the modern Shoshoni is tabulated below. As only those classes of objects found in the caves may be included, it is necessarily incomplete. Moreover, even within these classes, absences in the Promontory culture may not be assumed merely because the objects were not found. Nevertheless, most of these classes seem reasonably representative of the Promontory culture.

The Shoshoni culture is a composite picture based upon the asserted presences and absences procured by means of a trait list from Old Diamond and his sister, Posiats, both of whom belonged to the Promontory Shoshoni band, and from Grouse Creek Jack, a Shoshoni from the adjoining region to the northwest. The inclusion of Shoshoni data from farther afield would not materially alter the comparison.

In the following table plus signifies the presence of the trait; minus signifies its absence (and carries the implication that it really was not part of the Promontory culture); NF signifies that it was not found but is not necessarily absent; R that the trait was comparatively rare.

	Promontory culture	Shoshoni culture		Promontory culture	Shoshoni culture
Arrows:			Digging stick, plain hardwood	+	+
Shaft of cane	+	R	Juniper-bark rings	+	−
Shaft of hardwood	R	+	Wooden tubes	+	−
Point, side notched	+	+	Bird nooses tied to pegs	+?	+
Point, base notched	R	R	Dice of cane	+?	−
Shaft painted under feathers	+	+	Dice of wood	−	+
Arrow smoother: Two stones, each with one longitudinal groove	+	+	Hoop-and-dart game	+	+
Bow:			Hand-game bones	+	+
Self, of wood	+	+	Beaver-teeth dice	+?	−
Sinew-backed, of wood	+	+	Bone awls	+	+
Of sheep horn	NF	+	Bone flaking tools	+	−
Fire drill, compound	+	+	Antler flaking tools	−	+
Foreshaft in socket	+	−	Tubular bone beads	+	−
Foreshaft in split in shaft	NF	+	Mats:		
Foreshaft spliced	NF	+	Twined tule	+	+
			Twined juniper bark	+	+
			Sewed tule	R	−

[39] Culin, 1907, especially p. 271.

	Promontory culture	Shoshoni culture
Twined tule bags	+	−
Basketry	+	+
Coiled	+	−
Twined	−	+
Close-woven netting	+	−
Woven bands	+	−
Cord, 2-ply	+	+
Rope, 3-ply	+	+
Twined fur blankets	+	+
Twined bird-skin blankets	+?	−
Pottery:		
Shoshoni gray ware	−	+
Promontory black ware	+	−
Incised decoration	+	−
Disks	+	−
Mittens	+	−
Drums	+?	−
Skin and fur bags	+	+
Fringing on clothing, etc.	+	+
Moccasin:		
Promontory type	+	−?
One-piece, soft sole	−	+
Two-piece, hard sole	−	+
Uppers added	+	+
Moccasin lining:		
Fur turned inside	+	+
Grass or hair stuffing	+	+
Scrapers:		
Keeled or "thumbnail"	+	−?
Retouched slab	+	+
Irregular flint flakes	+	+
Hafted flint drill	+	+
Hafted flint knife	+	+?
Unhafted flint knife	+?	+
Etched stones	+	−
Mullers	+	+
Tubular stone pipe	+	+
Monitor stone pipe	NF	+

Certain of the traits here enumerated merit further comment. The side-notched arrow point occurs also in the puebloan pit lodges in northern Utah, is general among the Shoshoni and Paiute of Nevada and Idaho, and has an imperfectly known distribution outside the Great Basin, though it appears to be the more recent form in the Southwest and is the most recent type at Signal Butte, Nebraska.[40] The sinew-back bow is very general in North America north of Mexico, especially in the west. The longitudinally grooved stone arrow polisher is also found in Pueblo pit lodges in northern Utah and was used by all modern Shoshoni of Nevada, Idaho, and northern Utah. Its occurrence in the lowest level at Signal Butte, Nebraska, where it was associated with projectile points related to Folsom points, however, demonstrates its great antiquity.[41] The digging sticks are not unlike some crude Basket Maker digging sticks nor are they distinguishable from those used by all modern Shoshoni. Matting of tule and bark is both Shoshonean and Plateau. Matting from Lovelock Cave, especially of the late period, is much like Promontory matting.[42] Fur and bird-skin blankets are especially Basket Maker and Pueblo. In Lovelock Cave feather blankets were more common in the upper strata.[43] Modern Shoshonean blankets were more often made of fur, but occasionally of mud hen and other bird skin, except around Great Salt Lake and in Idaho, where only rabbit fur was used. The dart and netted ring game resembles Southern Paiute, Nevada and northern Utah Shoshoni, and some Plains specimens. Lovelock Cave yielded a knife handle[44] which is much like the handles in Cave No. 1, and a blade described as an

[40] Strong, 1935, pp. 231–232.
[41] Strong, 1935, p. 230.
[42] Loud and Harrington, 1929, pp. 28, 56–60.
[43] Loud and Harrington, 1929, pp. 27, 50–53.
[44] Loud and Harrington, 1929, p. 100.

"unfinished arrow point",[45] which has a diagonal base like some of the Promontory knives. The double-pointed, laurel-leaf blade of Lovelock Cave [46] does not occur, however, in any of the Promontory caves.

Certain Shoshoni traits which might reasonably have been expected among the abundant remains of Cave No. 1 but were not found are: metates, bird or rabbit nets, twined basketry, grooved hardwood arrows, perforated horn arrow wrenches, and some trace of the many Shoshoni dice games.

Non-Shoshonean features [47] of the Promontory culture are: the exclusive use of single rod or rod-and-bundle coiled basketry (some single rod coiling has been introduced in very recent post-Caucasian times among many Shoshoni); the distinctive pottery (the nature of modern Ute pottery is not known); the four-piece moccasin; the fire drill having the foreshaft inserted in the main shaft (Shoshoni and Paviotso foreshafts are spliced or inserted in a split); mittens (except among the Lemhi Shoshoni); etched stone slabs; juniper-bark rings.

Summarizing the resemblance of the Promontory culture to cultures of other regions, there are 6 elements of probable northern origin, 7 of probable southern or southwestern origin, 29 which it shares with modern Shoshoni of the same region (but many of these traits are very widespread), 22 traits which the Promontory culture possesses but the Shoshoni lack, 10 which the Shoshoni possess but the Promontory culture lacks. It is worth noting that of a total list of more than 2,500 Shoshoni traits, only 61 were comparable to the archeological material. So large a percentage of these 61 traits, however, fail to link the two cultures that it is a safe conclusion that the Promontory culture is definitely not Shoshoni as the latter is now understood and that it merits a distinctive name.

Apart from numerical considerations, the impression one gains from studying the material is that the culture is basically one of a northern hunting people and that it existed in northern Utah sufficiently long to acquire southern and local traits. The great differences between the Promontory people and the modern occupants of the region in such important diagnostic traits as pottery, basketry, and moccasins indicate a fair antiquity for this culture. It is even barely possible that such Southwestern traits as juniper-bark rings came through direct contacts with puebloan peoples in Utah. Such

[45] Loud and Harrington, 1929, p. 108, pl. 56, *j*.

[46] Loud and Harrington, 1929, p. 108, pl. 55, *a*, *b*, *l*. Incidentally, the latest occupants of Lovelock Cave seem not to have been Shoshonean.

[47] These comparisons with Shoshonean culture are based upon ten months of field work among Nevada, Idaho, and Utah Shoshoni made by the writer during 1935 and 1936 and upon Lowie's "Notes on Shoshonean Ethnography", 1935, and "The Northern Shoshoni", 1909.

contacts could not have endured long, however, for the Promontory culture lacks virtually all distinguishing traits of the puebloan pit-lodge culture of northern Utah.[48] This possibility, however, at once suggests that we may have remains left by one of the Athapascan-speaking tribes who, during their southward migrations, acquired puebloan traits from the tribes they are presumed to have driven out of the Northern Periphery.

More than this cannot be said at present concerning the origin and relationships of this culture. Except for Basket Maker and Pueblo cultures, Utah is unknown archeologically. Nevada, except for Loud and Harrington's work at Lovelock and Harrington's work at Gypsum Cave, and in Basket Maker and Pueblo sites, is virtually unknown. Idaho remains even more of a blank. A fertile field for investigation of prehistoric cultures lies in the Great Basin and Plateau, and it is not unlikely that it will afford many clues concerning the early history of the Shoshoneans and perhaps even of the Athapascan tribes of the Southwest.

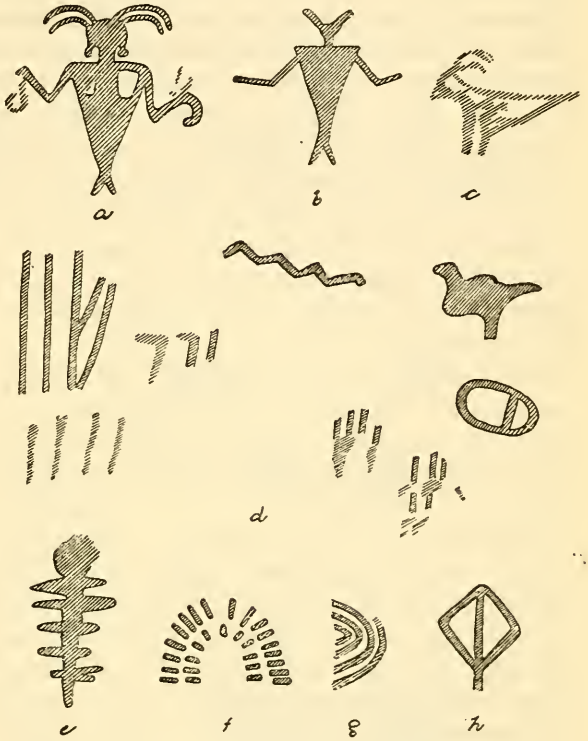


FIGURE 37.—Pictographs on Promontory Point.

PETROGLYPHS

Three red petroglyphs (fig. 37, *a–c*) occur in Cave No. 1. It is said that a fourth representing a mountain sheep was removed a few years ago. Two of the remaining figures represent triangular-bodied anthropomorphic beings which so resemble the Basket Maker kachina-like figures of the Northern Periphery that there is no ques-

[48] Steward, 1933 b, 1936.

tion that these are of Basket Maker-Pueblo origin.[49] This is the only evidence of this culture in any of the caves.

One of these kachinas (fig. 37, *a*) is on the northeastern wall about 4 feet above the cave floor, at a point where the wall slopes steeply into the low ceiling. The body is a triangle, with the apex down, terminating in two short lines representing legs, and having two blank spaces on the chest which may represent breast ornaments. The circular head bears two sweeping lines on each side, probably representing feathers, and short lines below, terminating in circles, representing earrings. The arms extend from the sides with the elbows somewhat bent. The hands appear to be holding something, though the paint is somewhat faded. The total figure is 15″ tall. Back of this, 3′ above the floor, are indistinct daubs of red.

The other kachina (fig. 37, *b*) on the wall at the rear of the cave is simpler. The body, legs, and head are much like the first, but the head is ornamented merely with a single pair of straight lines, probably representing feathers. The arms are extended to the sides. This is about 12″ tall.

The third figure is a much-faded mountain sheep (?) (fig. 37, *c*) located near the last, represented as facing toward the left.

No other petroglyphs were seen on the western side of Promontory Point, although a group is reported from a small canyon a few miles north of the railroad.

A group of red petroglyphs is located on the eastern side of Promontory Point, about 9 miles north of the railroad station and 200 yards from the highway. These are scattered on the wall of a very shallow cave which faces toward the northeast, thus somewhat exposing them to weathering. Part of the group is represented as it occurred in the cave in figure 37, *d*. This group is about 4′ wide. The figures are somewhat faded and it is difficult to know what was intended. They include: a group of parallel straight lines 10″ tall, a zigzag line, possibly a hand, possibly a bird(?), and a bisected oval. Another figure (fig. 37, *e*), 12″ tall, seems to be a creature with a round head and 5 pairs of legs. Another (fig. 36, *f*) is 2 groups of radiating lines. Another (fig. 37, *g*) represents several concentric arcs on their edge. The last (fig. 37, *h*) is a bisected diamond. It is impossible to assign these to any known culture. They are unlike petroglyphs generally found in Utah but bear some resemblances to petroglyphs on the Columbia River.[50]

A large group of unusual petroglyphs occurs on scattered boulders on the top of a hill just back of Connor's Springs (pl. 9; fig. 38). A few of these were published in an earlier paper.[51] They are

[49] Steward, 1933 b.
[50] Strong and Schenck, 1925.
[51] Steward, 1929, p. 151.

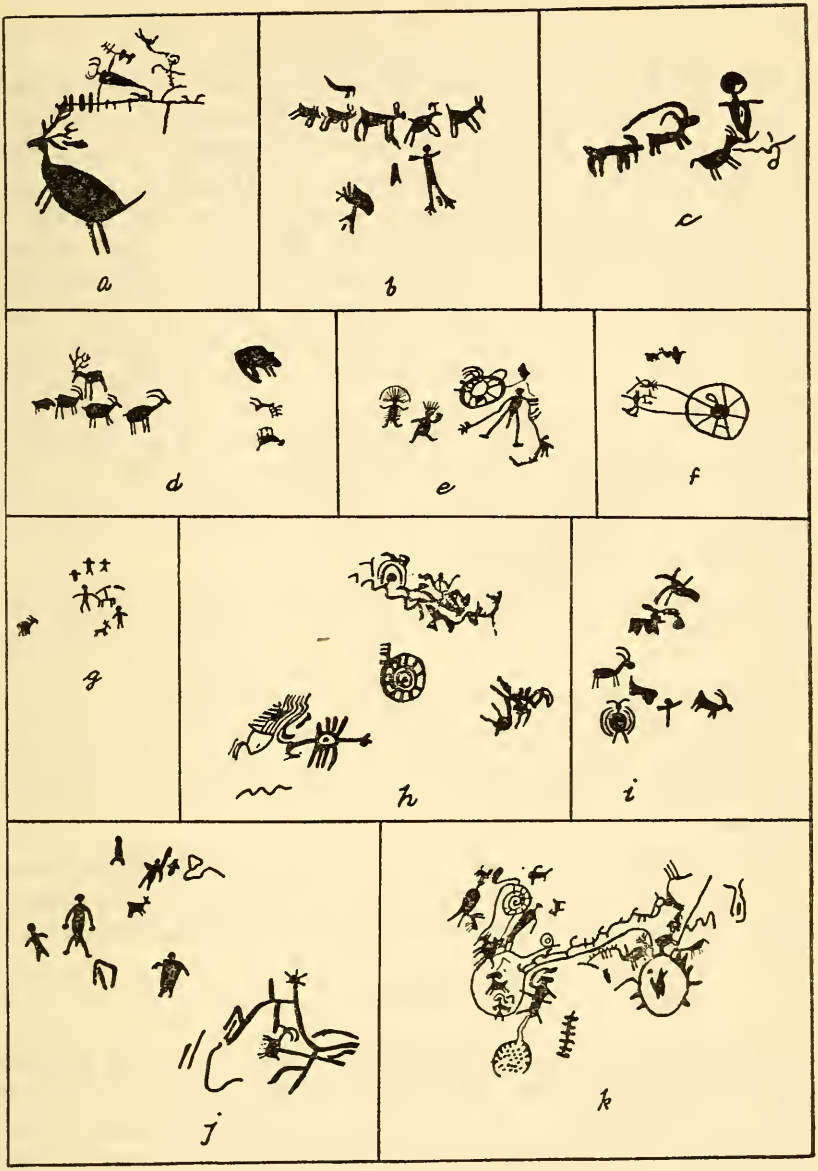


FIGURE 38.—Petroglyphs near Connor's Springs.

pecked through a heavy dark patina, which covers the comparatively light colored rock, and stand out brightly. Although it is generally dangerous to judge the antiquity of petroglyphs from the degree of weathering, some clue is afforded here. A number of initials and dates, chipped within the last 30 or 40 years, are dimmer than some of the petroglyphs, although exposure cannot account for the difference in weathering. There seems to be little question that the

majority of these petroglyphs have been made within the last hundred years, and perhaps many of them more recently.

The rocks are covered with a confusion of rather elaborate realistic figures, mixed with a few geometric designs, too numerous to describe in detail. Various animals are represented, some of which may be tentatively identified as deer or elk (fig 38, *a*, *d*, *k*), sheep or antelope (fig. 38, *b*, *c*, *d*, *g*, *i*, *j*, *k*), possibly a bear (fig. 38, *d*), and possibly some species of canine (fig. 38, *g*, *j*, *k*). Anthropomorphic figures are extremely variable, but do not include any which resemble Basket Maker kachina-like beings, with the possible exception of the double-horned figure in figure 38, *a*, and possibly two or three in plate 9. Many human beings are very simply portrayed (fig. 38, *j*). Others are more elaborate, some representing types which are known elsewhere in the Great Basin, e. g., men having excessively long arms or legs and large hands or feet (pl. 9, *a*, lower left and upper right corners; fig. 38, *b*, *e*). Two other figures (fig. 38, *e*) show hair standing up straight or headdresses; plate 9, *a* (left side), shows a somewhat similar headdress.

Geometric figures include: assemblages of ticked or crossed lines (pl. 9, *a*), spoked wheels (pl. 9, *a*, *b*, *d;* fig. 38, *f*, *h*), "sun disks" (pl. 9, *d;* fig. 38, *h*), and a great assortment of curved and wavy lines. Some complicated groups seem to represent composition. For example, there is probably some connection between the various designs in figure 38, *k*. The row of triangles in plate 9, *c*, conceivably represents a camp circle of tipis. It is dangerous, however, to attempt interpretation of any of these.

Certain resemblances of these to other figures in the Great Basin,[52] as well as their obvious recency, designates them as Shoshonean, although they show a strong influence of the petroglyph styles of Idaho.

CAVE NO. 2

Cave No. 2 is in the same formation as Cave No. 1, but lies much closer to Great Salt Lake, being only 66 feet above the level of the water in August 1931. It also was formed by wave erosion at a point where faulting had weakened and distorted the rock strata. Its greatest depth is 90 feet; its width approximately 100 feet (fig. 39). The ceiling is much lower than in Cave No. 1, having a maximum height of not over 15 feet, and being so low as to require one to stoop in many parts, especially in the small passages that run back from its rear. The entrance is about 18 feet wide and rather low (pl. 1, *c*), admitting little light to the interior. The eastern

[52] Steward, 1929.

half of the cave lies close to the cliff face; in fact, there is a tiny window at one point which is too small to admit a person.

A great rise in the center of the rocky floor of the cave divides it into two portions. The eastern half is filled with dust, which is kept moist by a slow drip. Test pits here failed to reveal a single trace of human occupation. Exploratory trenches in the recesses at the rear showed the deposit to be mostly an accumulation of dust, bearing only small seams of charcoal and occasional artifacts. As bedrock was encountered at 18 inches deep, it has no stratigraphic value. The main area of habitation was in the western half, just inside the entrance, where the floor slopes down from the cave mouth, dropping 6 feet. A trench dug down to lake deposits in 1930 showed evidence of human habitation throughout. A second larger trench was therefore dug in 1931, and the greater part of it carried down to beach gravels (pl. 2). It was found, however, that the deposits near the mouth of the cave comprised mainly coarse gravel which had washed in from the entrance. As artifacts were extremely rare in this part of the trench and as the season was drawing to a close, the outer 15 feet of the trench was dug only to 3 feet deep.

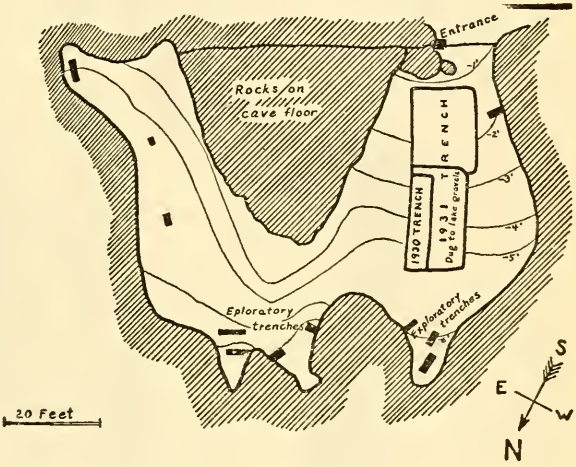


FIGURE 39.—Plan of Cave No. 2.

The procedure in excavating Cave No. 2 was to remove a few inches at a time, following as nearly as possible the natural strata, which were remarkably well defined, and to screen all the earth (pl. 1, *d*), except the upper 2 feet, which, like the deposits in Cave No. 1, were too fibrous to make this possible. For this reason the depths of artifacts given below do not in all instances represent absolute depths, but are mean depths of the strata in which they occurred, artifacts in a given stratum being kept together. The layers encountered may be grouped into the five main strata (pl. 5, *b;* fig. 39) listed below. Depths were taken at the deepest part of the trench, as indicated in figure 40.

1, approximately 30 inches of fibrous material, which shows evidence of considerable occupation, but which is far more decayed

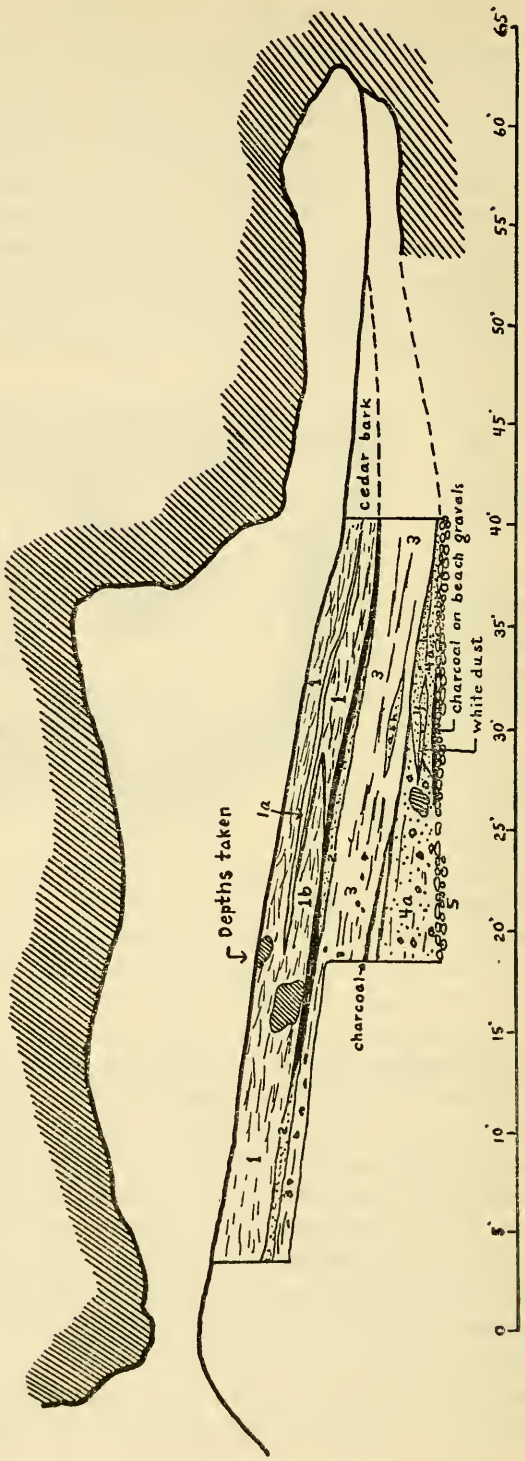


FIGURE 40.—Cross section of Cave No. 2.

than the comparable material in Cave No. 1 because water has washed and seeped into the cave. This stratum contains pottery throughout and represents the culture found in Cave No. 1.

1a, a thin layer of barren gravel, marking a temporary break in occupation.

1b, very little fiber; probably hearth site.

2, 6-inch stratum (2 feet 6 inches to 3 feet deep) of clean earth and angular gravel which lacks evidence of human occupation except under the large rock. This thins out and disappears at the western end of the trench. The gravel fell from the roof and washed in from the exterior, and indicates a considerable break in occupation of the cave by man.

3, 36 inches (3 feet to 6 feet deep) of banded charcoal, ash, and brown and gray soil.

4, large lens, 12 inches thick, of fine, clean, yellowish dust, having a fine band of white dust through it.

4a, 30-inch stratum (6 feet to 8 feet 9 inches deep) which is a continuation of the yellow dust and band of white dust from stratum 4, but which contains much angular gravel. In part of the trench this was encountered at 5 feet 5 inches deep, and is so designated in the table on page 106. It lacks bones and artifacts, except in the layer of charcoal at its very bottom, in the middle of the trench, where several broken bones were found. Several artifacts came from the lowest 6 inches of this stratum in the northern end of the trench. The bed of charcoal directly overlies stratified lake gravels. Most of strata 4 and 4a probably comprise wind-blown dust and possibly a small amount of water-laid silt. The undisturbed thin bands above the charcoal show that the cave was occupied but little by human beings during the accumulation of the bulk of this stratum.

5, rounded, bedded, lake beach gravels of unknown depth. These are slightly cemented on their surface. In places a small amount of angular gravel separates strata 4 and 5.

Many of the artifacts from the upper or pottery culture have already been described. Those which have stratigraphic significance are described below. The absence of artifacts of chipped stone from the upper 2 feet of deposits is due to the impossibility of screening this material. The loss is not serious, however, for the types are represented in Cave No. 1, the culture of which is identical with that of the upper 2 feet in Cave No. 2.

Stratification of Cave No. 2

Projectile points.—Stratum 1, surface to 24″ deep. Although no projectile points were found at this depth, Cave No. 1 proves the type to be a side-notched arrow point.

24″ to 30″ deep. The above-mentioned arrow point does not occur. In its place is a comparatively large, broad, more or less irregular point (fig. 41, *a–l*) which has the notches cut from the lower corners so as to leave a wide tang and frequently barbs. These vaguely resemble Basket Maker dart points, although the latter are side-notched, but are most like the quartzite dart points in Black Rock Cave. Specimens are: 9450 (fig. 41, *a*), present length, 1″; point broken; notches cut from corners, leaving broad tang and barbs. 11102–5 (fig. 41, *b*), obsidian; length, 1⅛″; thickness, ⅛″; workmanship, fair. 11102–1 (fig. 41, *c*), obsidian; length, 1¼″; thickness, ⅜″. 11102–6 (fig. 41, *d*), dark flint; length, 1¼″; thickness, ¼″; workmanship, crude. 11102–3 (fig. 41, *e*), obsidian; length, 1⅜″; butt broken; thickness, 5/32″. 11102–4 (fig. 41, *f*), obsidian; length, ¾″; tip broken; thickness, ¼″. 11102–2 (fig. 41, *g*), obsidian; length, 1½″; butt broken; thickness, 3/16″; more slender than usual; notches very shallow on sides. 11102–11 (fig. 41, *h*), obsidian; length, 1″; point broken; butt square; unnotched; may have been knife or scraper. 9457 (fig. 41, *i*), obsidian; length, 1⅜″; broken, but base seems to have had two long barbs without any tang.

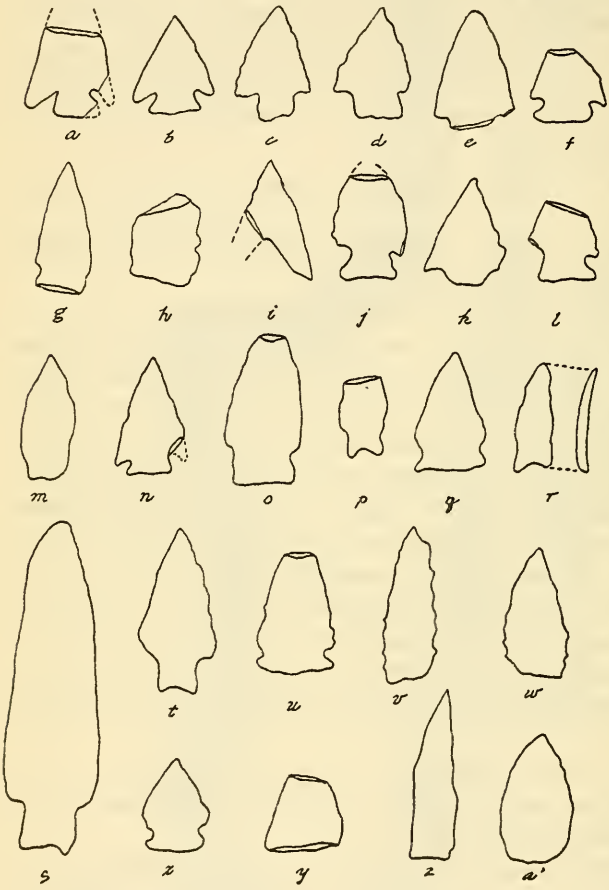


FIGURE 41.—Stone projectile points from Cave No. 2.

30″ to 36″ deep. Three of four points from this level are much like those described above; the fourth is plain. 11109–3 (fig. 41, *j*), obsidian; length, 1 3/16″; tip broken; workmanship, crude; corner-notched. 11109–4 (fig. 41, *k*), obsidian; length, 1¼″; workmanship,

fair; corner-notched, leaving a very short, tapering stem. 11109–2 (fig. 41, *l*), obsidian; length, 7/8″; tip broken; workmanship, crude; corner-notched, much like 11109–3. 11109–5 (fig. 41, *m*), obsidian; length, 1 3/8″; workmanship, fair; thickness, 3/16″; plain, leaf-shaped.

Stratum 2, 36″ to 42″ deep. This depth, comprising mostly the barren gravel stratum, yielded only one specimen (11113, fig. 41, *n*) of the corner-notched type found above. It is white flint, 1 3/8″ long, 3/16″ thick, with good workmanship.

Stratum 3, 42″ to 48″ deep, or just below the barren layer. The two points from this depth do not have distinctive characteristics. 11117 (fig. 41, *o*), gray chert; length, 1 3/4″; tip broken; thickness, 1/4″; slight notches at bottom of sides. 11119–1 (fig. 41, *p*), obsidian; length, 1″; tip broken; workmanship, crude; stem is swallowtail.

48″ to 53″ deep. One of two points from this depth (11120–3, fig. 41, *q*) is a broad obsidian point, 1 3/8″ long, 1/4″ to 5/16″ thick, with shallow side notches. The other (11120–1, fig. 41, *r*), also of obsidian, is made of a very crooked and narrow flake, and has notches in the side and base which are scarcely perceptible. It is 1 1/4″ long.

53″ to 59″ deep, no points.

59″ to 65″ deep. Two of four points from this depth are unusual. 11134–1 (fig. 41, *s*) is a beautifully made point of streaked, waxy brown flint, 3 3/4″ long, 1/4″ thick. Besides its great length, a striking characteristic is the swallowtail butt. 11134–2 (fig. 41, *t*) is very similar to the last and is well chipped of greenish flint. It is 1 7/8″ long, 3/16″ thick, and has a butt like the last. These resemble the large dart points from the lower levels of Lovelock Cave [53] and the Pinto Basin points in California.[54] 11133 (fig. 41, *u*) is an obsidian point which is shallowly side-notched like 11117. It is 1 3/8″ long, the tip being broken, 7/8″ wide and 1/8″ thick, made from a partly retouched flake. 11137 (fig. 41, *v*) is a plain, leaf-shaped point of brown flint, 1 3/4″ long, with serrate edges. 11128 is a fragment of an obsidian blade, each end of which is broken, but which appears to have been rather long.

Strata 4 and 4*a*, 65″ to 71″ deep. 11144 (fig. 41, *w*) is a leaf-shaped point, like 11137, of very clear obsidian. It is 1 1/2″ long, 3/16″ thick, and crudely made. 11141 (fig. 41, *x*) is a short, wide point with shallow side notches, of almost transparent obsidian, 1/8″ thick, 1 1/16″ long, 3/4″ wide, and is well made. Another specimen (11141) is a fragment of an obsidian blade or point which is broken at each end.

71″ to 77″ deep. The only specimen from this depth is a very slender, irregular point of poorly chipped obsidian (11148, fig. 41, *z*).

[53] Loud and Harrington, 1929, p. 108.

[54] Campbell, E. W. and W. H., 1935; Amsden, C. A., 1935.

It is $1\frac{15}{16}''$ long, only $\frac{1}{2}''$ wide, $\frac{3}{16}''$ thick, and has scarcely perceptible side notches.

77″ to 81″ deep, no specimens.

The lowest level, 6″ above the lake gravels, yielded only a single leaf-shaped blade or point (9431, fig. 41, *a'*).

KNIVES AND SCRAPERS.—Scrapers fall into the three groups described above: 1, "thumbnail", keeled or end scrapers; 2, retouched slabs, generally of slate; 3, retouched and unretouched flakes of obsidian and flint. By "knives" are meant blades, usually of flint or obsidian, which are too large and broad to be projectile points and/or which are unnotched.

Stratum 1. No specimens were found above a depth of 24″.

24″ to 30″ deep. An end scraper from this depth (11102–12, fig. 42, *d*) is poorly made; it is a flake of obsidian, retouched from one surface only. It is $1\frac{1}{8}''$ long, but the upper or scraping end is broken off.

9452 (fig. 43, *f*) is a more or less triangular slate slab, $1\frac{3}{4}''$ long, broken at each end, $\frac{3}{16}''$ thick, and having its long edges chipped to sharpness.

Two other specimens (11102–9, fig. 42, *b*, and 11102–10, fig. 41, *c*) are good examples of irregular obsidian flakes, the edges of which have been retouched from one surface for cutting. 11102–9 is $2\frac{1}{4}''$ long; 11102–10 is $2\frac{1}{8}''$ long. 11099 is an angular rock, $2\frac{7}{8}''$ long, $1\frac{3}{4}''$ wide, $\frac{7}{8}''$ thick, the edges of which have been retouched. 11096 (fig. 43, *e*) is a large crude flake of dark gray streaked flint, $2\frac{1}{2}''$ long, $\frac{5}{8}''$ thick. One edge has been retouched on both surfaces to serve as a knife or scraper. 9452 is two small, unchipped obsidian flakes, the edges of which show slight wear.

The following blades are chipped all over on both surfaces. 11102–7 (fig. 43, *a*) is a long, slender blade (possibly projectile point), well made from black flint, $\frac{1}{4}''$ thick, $2\frac{1}{4}''$ long, but having both ends broken. 11101–1 (fig. 43, *b*) is the point of a knife or scraper which is very crudely chipped of quartzite, $\frac{3}{16}''$ thick. Its present length is $1\frac{5}{8}''$. 11101–2 (fig. 43, *c*) is a complete blade, probably of the same type as the last, of rose quartzite. It is $2\frac{1}{2}''$ long, $1\frac{1}{4}''$ wide across its rather square base, and $\frac{3}{16}''$ to $\frac{1}{4}''$ thick. 11101–3 (fig. 43, *d*) is a knife or projectile point, crudely chipped of white flint, $\frac{1}{4}''$ thick, $1\frac{5}{8}''$ long, its butt end broken.

30″ to 36″ deep. 11109–1 (fig. 43, *g*) is a large fragment of obsidian, $2\frac{5}{8}''$ long, $\frac{7}{16}''$ thick, one edge of which has been retouched from both sides to sharpness. 11109 is a crude, unchipped obsidian flake used as a scraper.

Stratum 2, 30″ to 42″ deep. 9473 (fig. 42, *e*) is a small end scraper of obsidian, 1″ long, $\frac{5}{16}''$ maximum thickness, $\frac{3}{4}''$ wide, with a very

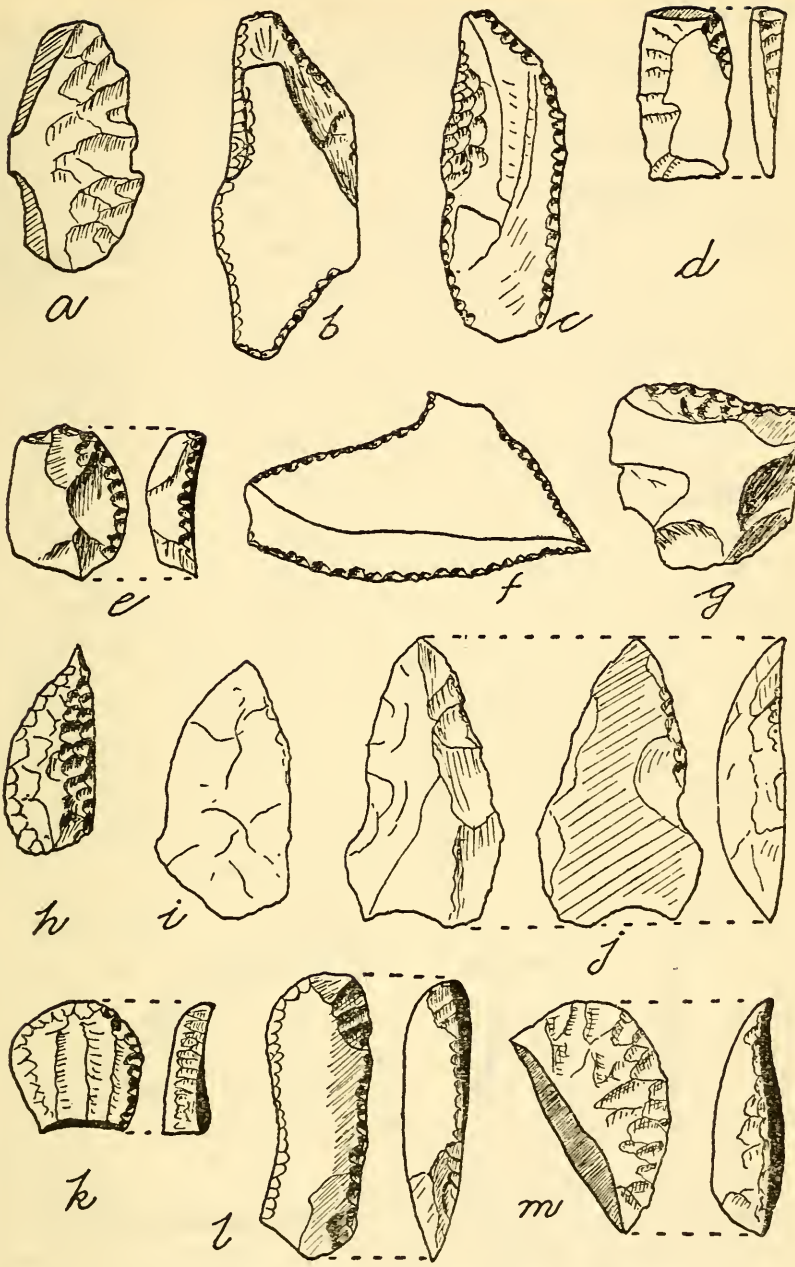


FIGURE 42.—Small stone scrapers from Cave No. 2.

concave under surface. 9440 (fig. 43, *h*) is an obsidian flake, 2½″ long, ¼″ thick, the edges of which are unchipped, but have been used for scraping.

Stratum 3, 42″ to 48″ deep, just under the layer of barren gravel. 11114 (fig. 43, *j*) is the point of a triangular slate blade made of a

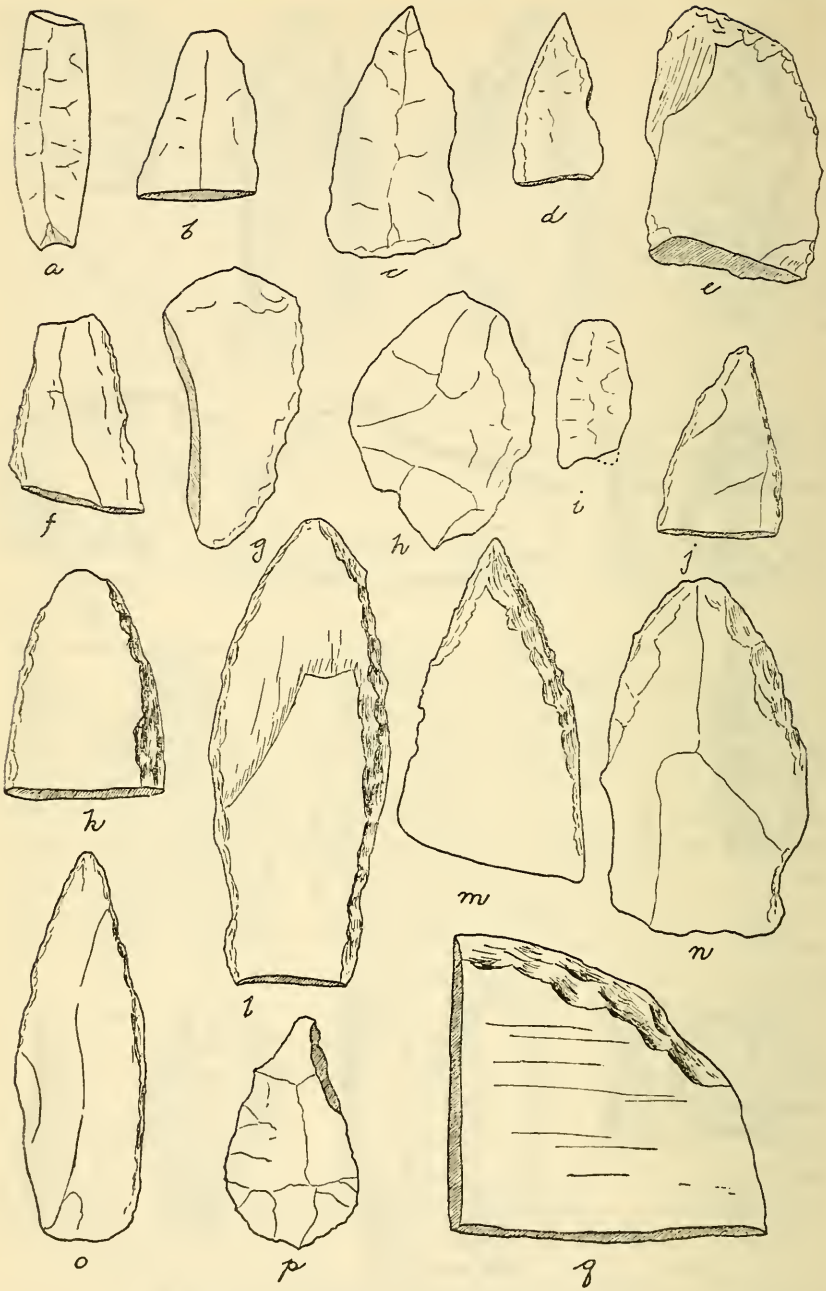


FIGURE 43.—Stone knives and scrapers from Cave No. 2.

natural slab, 3/16″ thick. It is 1¾″ long, the butt end being broken, or left unchipped. The other two sides are sharpened by chipping, making a rather rough edge.

11119 (fig. 42, *g*) is a more or less squarish obsidian flake, 1¼″ long, one edge of which has been retouched from one surface only.

11119–4 (fig. 42, *f*) is an unworked flake of obsidian, 2⅛″ long, the edges of which are so roughened by use as to appear as if they had been chipped. This is interesting in that a concave edge has been used, perhaps as a kind of spokeshave.

11119–5 (fig. 42, *h*) is an obsidian blade, or perhaps unnotched projectile point, chipped on both surfaces to form a leaf-shaped point, 1⅜″ long, 7/32″ thick. It has an unusually sharp point which could well have been used for drilling or piercing, although there is no suggestion as to what manner of handle it had. 11115 (fig. 43, *i*) is a small blade of pinkish quartzite, chipped over both surfaces. It is 1½″ long, 3/16″ thick, and has a rounded point and concave base.

48″ to 53″ deep. The most interesting scrapers or knives from this depth are three slate slabs with edges chipped to sharpness. 11121–1 (fig. 43, *l*) is most complete, being 4⅜″ long, ⅜″ thick, and 1¾″ maximum width. It is more or less leaf-shaped but has a slight constriction which might be regarded as notching ¾″ from the butt end, which is 1⅛″ wide, and either broken off squarely or the natural end of the slab. Except for this butt end, all the edges are chipped. 11121–2 (fig. 43, *k*) is the point of a blade like the last, 2⅛″ long, 1½″ wide, chipped along its edges except for the break across the butt. 11121–3 (fig. 43, *m*) is also the point of a blade like 11121–1. It is 3⅛″ long to where it is broken across the butt end. One edge is chipped to a rough sharpness; the other is only partly chipped as it is naturally sharp. 11121–4, –5, –6 are small fragments of slate.

11120–2 (fig. 43, *i*) is a roughly retouched flake of obsidian, 1⅝″ long, ¼″ thick. Two other irregular, unchipped flakes of obsidian (11120–4, –5) have somewhat worn edges.

53″ to 59″ deep. 11126 (fig. 43, *n*) is a somewhat irregular slate slab, 3⅜″ long, ⅜″ to 7/16″ thick, 2″ maximum width, having a rounded point and a squarish butt. Its edges are chipped to sharpness.

11128 (fig. 42, *j*) is a very crude obsidian flake, one face of which is left flat and practically unchipped; the other is chipped to make the blade roughly pointed, 1¾″ long. 11128 also includes two irregular flakes of brown flint, the edges of which are not retouched but show wear.

59″ to 65″ deep. 11132 (fig. 42, *k*) is a well-shaped end scraper of white flint, 13/16″ long. 11133 (fig. 42, *l*) is of obsidian and resembles an end scraper but is somewhat longer than most of those heretofore described, being 1 13/16″ long and only ⅝″ wide. The edges, which are retouched from one surface for the entire length, show wear.

11136 (fig. 43, *o*) is a slate slab with edges chipped to form a blade 3⅝″ long, ⅛″ to 3/16″ thick; it has a maximum width of 1¼″. The butt end, broken square across, is ⅝″ wide.

11139 is two small unchipped obsidian flakes with bulbs of percussion, the edges of which show wear. 11138 is a triangular flake of brownish quartzite like that used for the Black Rock dart points, 1¾″ long and 3″ across its broken butt. The two sides forming the point are retouched from both surfaces to form a sharp edge. 11130 (fig. 43, *p*) is a broad, leaf-shaped point of creamy chert, crudely chipped over both surfaces. It is 2¼″ long, 1¼″ wide, ¼″ to ⅜″ thick. 11135 is a blade of spotted gray flint, chipped over both surfaces but broken at each end.

Strata 4 and 4a, 65″ to 71″ deep, from the northern end of the trench where stratum 4a thins out; that is, from within 6″ of lake gravels. 11142 (fig. 43, *g*) is a natural slab, probably of calcite, from a deposit in a crack, in the form of a quarter square with a 3″ radius. It is 7/16″ thick. Part of the curved circumference is chipped to form a more or less sharp edge, although the chipping may have been simply to produce the curve.

77″ to 79″ deep. 11150–1 (fig. 42, *m*) is the deepest specimen found. It occurred in the 2″ of deposit which overlies a white dust deposit in stratum 4, which is in turn on brown dust which covers bedrock at this point. It is a keeled scraper of creamy white flint, 1½″ long, 7/16″ maximum thickness. The edge is sharp and evenly chipped from one surface, but the butt is broken away.

Mullers or manos.—Several specimens of mullers, much like those described above, came from Cave No. 2.

Stratum 1, 24″ to 30″ deep. 11087 (fig. 36, *d*) is a fragment of muller of fine hard sandstone, 2¾″ wide, 1⅝″ thick. It is more or less oval in cross section, the top side being pecked, the lower side being the grinding surface, which is so rounded as to imply considerable rolling motion in its use.

Stratum 3, 48″ to 53″ deep. 11124 (fig. 36, *f*) is the end of a muller made from a natural water-worn pebble of oölitic limestone. It is 3¼″ long, 2⅜″ wide, ⅞″ thick, and has but one grinding surface.

Bone awls.—Stratum 1, 24″ to 30″ deep. 11094 (pl. 8, *b*), of bird wing bone; length, 3″; butt cut square.

30″ to 36″ deep. 11104 (pl. 8, *g*), splinter of large bone; length, 5 5/16″; edges and butt rounded and well polished. 11105 (pl. 8, *h*), deer or antelope leg bone; length, 5⅞″; knuckle serves as butt.

Stratum 3, 42″ to 48″ deep. 11112 (pl. 8, *i*), well-polished awl; length, 4⅜″. 11116 (pl. 8, *j*), bone point from splinter; length, 3⅞″; less sharp than awl; could have served as dart point, but edges are worn with use; may have been flint flaker.

48″ to 53″ deep. 11122 (pl. 8, *k*), deer (?) bone with knuckle remaining as butt; length, 2⅞″; much used.

53″ to 59″ deep. 11127 (pl. 8, *n*), splinter of large bone; length, 2 1/16″. 11129 (pl. 8, *m*), long bone of large mammal; knuckle, which is somewhat trimmed, serving as butt; length, 4 3/8″; well shaped and much worn.

Strata 4 and 4a, 65″ to 71″ deep, or 6″ above lake gravels at north end of trench. 11143–1 (pl. 8, *o*), splinter of long bone of large mammal; smoothed all over; scratches of shaping instrument show; length, 4 1/4″. 11143–2 (pl. 8, *p*), splinter of large bone; only point smoothed; length, 3 3/16″.

Miscellaneous bone and horn objects.—Stratum 1, 24″ to 30″ deep. 11091 (pl. 8, *e*), fragment of a thin flat bone, probably of a scapula, one edge of which is somewhat rounded; the other edges broken; has hole 1/8″ diameter drilled through it; perhaps is disk neck ornament. 11092 (pl. 8, *a*), unshaped bone fragment, 1 5/8″ long; surface and edges polished and rounded with wear; perhaps gaming bone. 11095 (pl. 8, *c*), antler cut 2 3/4″ from base or proximal end.

30″ to 36″ deep. 11108 (pl. 8, *f*), broken bird bone bead; length, 1 3/16″; diameter, 3/16″; ends cut square; polished.

Stratum 3, 48″ to 53″ deep. 11123 (pl. 8, *l*), long bone of large mammal, cut off 7/8″ from knuckle; probably discarded scrap.

Strata 4 and 4a, 65″ to 71″ deep. 11146 (pl. 8, *q*), bird bone bead; length, 1 1/8″; diameter, 3/16″; ends cut square and smoothed.

Other objects.—Stratum 1, 24″ to 30″ deep. 9452, three small water-worn pebbles, and 11100, one small water-worn limestone pebble, were possibly pot polishers. 9452 also includes a small lump of obsidian, the edges of which are not sharp as in normal fractures, but are beveled and slightly scooped, about 1/32″ wide, as if a tiny gouge had been run along them. It is difficult to see how or why this was done.

9464 and 11093, shell fragments. 11093–1, fragment of shell, both sides of which are covered with red paint. 11093–2 (pl. 8, *d*), shell fragment (*Margaritana margaritifera* Linn.) having a hole 3/16″ in diameter near one edge and traces of another hole in its broken edge.

11098, slightly dished fragment of coarse sandstone, possibly a metate fragment; if so, this is the only trace of metates in the caves.

30″ to 36″ deep. 11106, hardwood stick; length, 9 3/8″; diameter, 5/16″; tapers to point; probably arrow or dart foreshaft. 11107, hardwood stick; length, 8 7/8″; diameter, 5/16″; bark remains; one end cut; other end burned.

Stratum 3, 42″ to 48″ deep. 11118, slabs of micaceous rock, foreign to the mineral formation of the cave rocks.

53″ to 59″ deep. 11131, shell fragment.

59″ to 65″ deep. From this depth came a single sherd of pottery (11140). It has extremely sandy paste, made up largely of small, rounded grains with a few larger, rounded particles. The exterior is brownish and smoothed but uneven. This is not the usual cave pottery, nor does it resemble the puebloan ware in the region. As it was found more than 2½′ lower than any other pottery, it is difficult to interpret it as other than a stray piece from the upper levels of the deposit, brought down by some burrowing animal. 11131, fragment of "clam" shell.

65″ to 71″ deep. 11145, shell fragments.

Fauna.—Mammalian remains comprise only species recently characteristic of the area. Of special interest, however, are 29 specimens scattered through all levels from the surface to the 6″ of dust overlying the lacustrine gravels at the bottom of the deposit. One highly competent zoologist identified all of these as dog (*Canis familiaris*). Another identified them as wolf and coyote. A third expressed doubt, but inclined to believe that none represented the dog. This disagreement in expert testimony portends serious difficulties in establishing the history of the dog in the New World. In the western United States, however, there are certain facts which may throw light on this disagreement. It is commonplace today for dogs of various kinds to cross with coyotes. If, as is probable, this happened in the past, many of the mixed breeds may have been kept as pets. In fact the "dog" may actually have been so nearly a coyote that its skeleton is indistinguishable from it. On any other hypothesis, it is difficult to account for the moot bones, unless it be assumed that the coyote was eaten in the past. The coyote is today taboo to all western tribes. When a coyote is slain, the skin, not the entire body, is brought to the camp. It is therefore more likely, though by no means certain, that these bones represent some domesticated or partly domesticated dog.

Bird remains were surprisingly scarce. The only identifiable specimen is the coot (*Fulca americana*), from between 48″ and 53″ deep.

Game mammals were kindly identified by Dr. G. S. Miller of the United States National Museum. Mountain sheep (*Ovis canadensis*), mule deer (*Odocoileus hemionus*), and the pronghorn antelope (*Antilocapra americana*) were present in all strata to a depth of 79″, the first two being more common through the deposit and occurring also in the dust overlying lacustrine gravels. The bison (*Bison bison*) occurs in most strata from the surface to a depth of 71″ but is relatively scarce when compared with its abundance on the surface of Cave No. 1. Identifiable rabbits (*Lepus*) and woodchucks (*Marmota flaviventris engelhardti*), both important foods of the modern inhabitants of the region and both common in the Black Rock Cave, are surprisingly rare.

History of Cave No. 2

If the chronology of Lake Bonneville as outlined in the Introduction be tentatively accepted, Cave No. 2 may have been left dry and habitable about 5,000 years ago. Since, however, there is a probable error in this figure of 1,000 to 2,000 years, we may say that human beings could have occupied the cave for the first time between 000 B. C. and 5000 B. C. Although this may seem to be stating he time limits too broadly to have any great significance, it is felt hat further work both in the prehistoric cultures of the Great Basin nd in the geology of Lake Bonneville will greatly narrow this range. Meanwhile, it is profitable to have at least minimum and maximum lates with which to work, so that the data contained in Cave No. 2 nay be analyzed.

It is clear that when the lake receded from the level of the cave ts waters had been washing and rounding the gravel on the cave loor, leaving it stratified in a manner typical of lacustrine deposits. It is also clear that a vast proportion of the debris on the cave floor s detritus which has washed in from the outside and which has been ccumulating without reference to human agencies since the cave was irst left free of lake water.

If any great time had elapsed between the recession of Lake Bonneville and the first use of the cave as a human habitation, the wash from the outside, augmented, perhaps, by aeolian deposits, should ave introduced an appreciable stratum overlying the lake gravels containing no evidence of human beings. Actually, however, fair-sized lumps of charcoal and bones split for marrow rest directly upon the rounded, bedded gravels. In short, human beings used the cave when the recession of the water first left it habitable.

The earliest occupation of Cave No. 2, then, may have been contemporary at least in part with the earliest Basket Maker period of the Southwest, which Kidder tentatively dates as beginning 1500 or 2000 B. C.,[55] and may even extend back to the hypothetical Basket Maker I period. Although there is nothing in the early culture of Cave No. 2 which can be specifically equated to known cultures elsewhere, it must be borne in mind that if objects other than those of flint and bone were available from this site, the cultures might be definable in terms of the Basket Maker or some other culture. The paucity of specimens and the limited variety of artifacts, however, indicate that the culture was, at its best, impoverished.

[55] 1924, p. 119. The Basket Maker III period endured until a few hundred years B. C. in the San Juan Valley, but many Basket Maker features later spread and survived until much more recently (about 800 or 1000 A. D.) in the Northern Periphery. Steward, 1933 b. Recent estimates, moreover, have placed the early Basket Maker (II) period near the time of Christ.

Data on objects of stone and bone from Cave No. 2 have been tabulated below. An examination of this table reveals primarily that the culture was static and charged but little in the minimum of 3,000 years. Obsidian, flint, and quartzite were used in about the same proportions for chipped implements at all levels, obsidian always being definitely preferred. Types of chipped implements, moreover, are largely the same throughout. End scrapers and leaf-shaped blades occur from the earliest period, represented in the lowest stratum, to the recent pottery culture. Slate blades, retouched and nonretouched flakes used as scrapers, and points with shallow side-notches occur in all levels, except near the bottom, where all artifacts are extremely rare. All of these types of implements are, however, so widely distributed elsewhere as to have little diagnostic value, and it would be surprising were they not found throughout the deposits.

Of greater significance, perhaps, are certain projectile points. Those from the lowest levels, stratum 4, are either more or less leaf-shaped (some of these may, of course, have been knives) or are side-notched. The former resemble the leaf-shaped points in the Pinto Basin, California,[56] and in the lowest level at Signal Butte, Nebr.,[57] though they are not the most common type there, and are found in comparatively recent sites elsewhere. Typological similarity, of course, does not prove contemporaneity and the resemblance of leaf-shaped points in these three sites, if not chance, may indicate only considerable vertical distribution of the type. The side-notched point, one of which was found at the bottom of stratum 3 and one in stratum 4, is more like the Basket Maker dart point than any other type in the greater Southwest, but is definitely insufficient evidence to equate these levels to the Basket Maker. As a matter of fact, these lower level points are too scarce to have real statistical value and may serve only as clues to be checked in other stratified sites.

In stratum 3, between 40″ and 65″ deep, were three "swallowtail" points. This type is rare in the Salt Lake region and did not occur in the Black Rock Cave, but is much like that found by Loud and Harrington to be characteristic of the older dart points in Love-Lock Cave.[58] Possibly these provide a cross-check with Lovelock Cave. They also closely resemble the Pinto Basin points in California, though the latter are somewhat shorter and slightly serrate. Allowing the swallowtail points the maximum age conceivable in the light of Lake Bonneville geology, they fall far short of the antiquity claimed for the Pinto Basin specimens. Although it is entirely possible that the latter are indeed extremely old, it must be borne in mind

[56] Amsden, 1935, pp. 42–44, pl. 12.
[57] Strong, 1935, p. 233.
[58] 1929, p. 108.

hat despite their failure to resemble points of any known recent ulture in southern California, they are all surface finds, and that netates and pottery were found at the same site.[59] Again, however, ypological similarity in one or two kinds of artifacts does not prove ontemporaneity.

The bulk of the points occurring above the swallowtail points but elow the pottery culture are distinctly shorter and broader than the ower specimens and are basically triangular, with notches cut from he lower corners to leave stems of varying shapes and proportions nd often slight barbs. Now, although corner-notched points are ommon in many periods and cultures (these greatly resemble many oints found in the eastern United States), in these caves they have eal stratigraphic significance. The same notching occurs in some f the Black Rock points which differ from these chiefly in being arger and of quartzite rather than obsidian. Only one, possibly wo, of these were found below stratum 2, whereas nine occurred above t. This type, however, soon gave place during the height of the ottery culture to the side-notched arrow point which is represented n Cave No. 1, but was not found in Cave No. 2 because the upper ayers could not be screened.

Possibly also of some stratigraphic value are the chipped stone nives. These distinctly belong with the pottery culture in Cave No. 2, and are common in Cave No. 1, being intended for hafting in vooden handles.

Objects of bone have no stratigraphic value. Awls made both from one splinters and from whole bones with the knuckles or joints left as butts are represented in most of the lower levels (though the splin-er type occurs in stratum 4, whereas the other type does not). These are also known from the puebloan sites throughout western Utah nd are represented in the pottery culture of Cave No. 1. Beads made of sections of bird bones likewise are found in various depths in

[59] In the southern end of Eureka Valley, near the northern end of Death Valley, California, there is a site bordering a playa and extending several miles. Thousands of flint flakes with relatively few artifacts mark it as predominantly a workshop, though the source of the flints is several miles distant in the mountains. The nearest water is a spring 3 to 5 miles away. There is no apparent reason why anyone should choose a place lacking water, having virtually no vegetation, and, in fact, devoid of anything of apparent use to man or beast, for a workshop or other purpose. Nevertheless, the presence here of large spherical stone mortars of the type used by Death Valley Shoshoni and at least one arrow point of the Shoshonean type is presumptive evidence that the Shoshoni visited the site, though it does not, of course, prove that they used it as a workshop. Although Mr. and Mrs. Campbell have never found a camp site more than 3 miles from a water hole in southern California (1935, p. 26), the writer has repeatedly received accounts from Shoshoni and Paiute informants of camps maintained by entire families and groups of families for days at a time 10 and even 20 miles from water when seeds, salt, flints, edible insects, or other important supplies made it worth while to do so. Water is used sparingly and when the ollas in which it is transported are empty one or two persons make the long trip to replenish them. Remoteness from present water, then, is not, per se, the slightest proof that a site dates from the pluvial period.

Cave No. 2, as we should expect in view of its occurrence at Signal Butte [60] and in Basket Maker [61] and later sites.

Artifacts of bone and chipped stone in Cave No. 2

	End scrapers	Retouched flakes	Unretouched flakes	Slate blades	Chipped blades	Leaf-shaped blades	Broad, corner-notched points	Shallowly side-notched points	Side-notched arrow points	Swallowtail points	Awl, bone with joint	Awl, bone splinter	Bird-bone bead
Stratum 1:													
Surface to 2'----	X	X	X	X	X	X	0	0	X	0	X	X	X
2' to 3'---------	2	4	3	1	4	1	9	2	0	0	1	1	1
Stratum 2:													
3' to 3' 6''------	0	0	0	0	0	0	1	0	0	0	0	0	0
2' 6'' to 3' 6''A--	1	0	1	0	0	0	0	0	0	0	0	0	0
Stratum 3:													
3' 6'' to 4' 5''---	0	2	3	4	1	1	1?	2	0	1	1	1	0
4' 5'' to 5' 5''---	2	2	4	2	1?	2	1	0	0	2	1	1	0
Stratum 4:													
5' 5'' to 6' 9''---	1	0	0	1?	0	2	0	1	0	0	0	2	1

X, represented in Cave No. 1.
A, from the northern end of the trench, where stratum 2 thinned out so that the layer included a few inches from both above and below stratum 2.

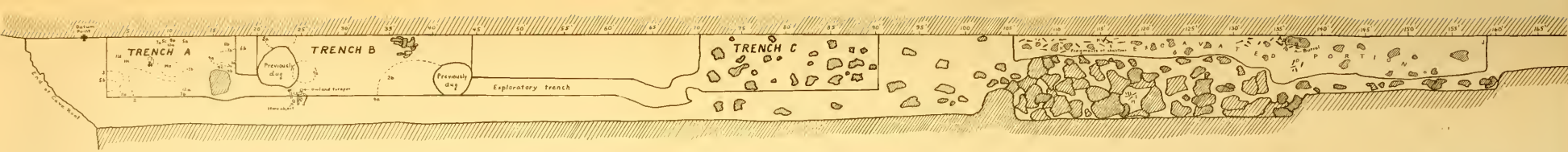
SUMMARY.—Cave No. 2 was first occupied at least 3,000 years ago by human beings who built fires upon the lacustrine gravels, but whose few artifacts include nothing by which to distinguish them. After some time had elapsed, during which the cave was intermittently used, there came a people whose only distinguishing artifacts were the swallowtail points and slate blades, but who left other bone and chipped stone artifacts of types found widely elsewhere. The depth of their refuse, stratum 3, suggests that they used the cave during a long period. There followed an interval during which the cave was not used, after which came a people who made at first broad, corner-notched points, and later smaller, side-notched points which are definitely for arrows. They were the makers of pottery; their culture is more fully represented in Cave No. 1.

It is curious that Cave No. 2 yielded not a trace of the puebloan peoples who left pit lodges and other remains around Great Salt Lake. This is unfortunate, for the relative age of these two cultures has not yet been established through stratigraphy.

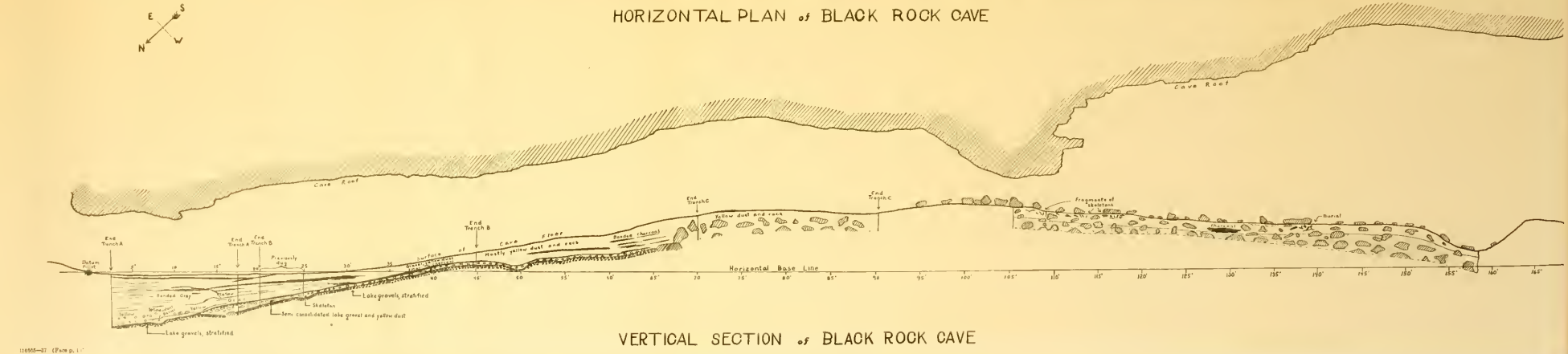
BLACK ROCK CAVE

Black Rock Cave is located on the south shore of Great Salt Lake, one-half mile west of the Black Rock bathing resort, about one-fourth mile from the lake, just over the Stansbury terrace of Lake Bonneville, or 364 feet above the level of Salt Lake in July 1931 (pl. 4, *a*, *b*, *d*). A soft vertical stratum of rock, traces of which remain,

[60] Strong, 1935, p. 235.
[61] Guernsey and Kidder, 1921, pp. 103–105; Roberts, 1929, p. 132.



HORIZONTAL PLAN of BLACK ROCK CAVE



VERTICAL SECTION of BLACK ROCK CAVE

116565—37 (Face p. 1)

FIGURE 44.—Plan and cross section of Black Rock Cave

was washed out by Lake Bonneville when at that level, later filled with conglomerate, and again washed out, to leave a cave about 100 yards long. The cave is almost perfectly straight (the southeast wall varied by 3 inches in 100 feet), 12 to 13 feet wide, and an average of 15 feet in height from the lacustrine gravels on the floor to the irregular ceiling (fig. 44). Fresh-water springs occur within a few miles of this site.

The outer part of the cave, i. e., from the entrance to 105 feet back (pl. 4, *d*), contained stratified remains of human occupation, nearly 6 feet deep at the entrance, thinning out toward the rear as the lake beach gravels below sloped upward. Beyond 105 feet a narrow passage leads into another long chamber which contained, in the first 40 feet, badly mixed and scattered human skeletal remains (11053), animal bones (also 11053), rocks, and artifacts described below. The cave dips abruptly downward beyond this, then levels off, growing narrower to the rear, 300 feet straight back from the entrance. Excessive moisture beyond 140 feet from the entrance has made human occupation impossible, and no traces of man other than initials recently scrawled on the walls were found. Only the portion of the cave near the entrance, then, was suitable for habitation, and the greater depth of ash beds and refuse at this point shows that most living was carried on within 30 or 40 feet of the exterior.

Excavation of the outer part of the cave was carried on in three trenches, A, B, and C (fig. 44), each of which was sunk to beach gravel. Trench A, 15 feet long, was the most important, as it contained the richest deposits and was 6 feet deep at its outer end. Trench B, 24 feet long, contained deposits which thinned out to only 18 inches deep at the upper end. Trench C was so shallow and contained so many large boulders and so few artifacts that it was not completely excavated.

The deposits in trench A, which give the most representative cross section of the cave, comprise, throughout their entire depth, bands of charcoal, ash, and soil discolored with refuse. These do not fall into natural subdivisions (fig. 45). As the ground outside slopes down away from the mouth of the cave so that detritus could not have washed into the cave, this accumulation inside has resulted from human occupation, with the exception of such gravel as has fallen from the disintegrating conglomerate which forms the ceiling.

The procedure in excavating was to remove and screen a few inches of earth at a time, following, as nearly as possible, the natural strata, which were thicker toward the cave entrance. The depths given below in describing the culture represent the mean depth of all strata except the bottom two.

Stratification of Black Rock Cave

Stratification in trench A was:

Surface to 4″ deep, dry, hard-packed gravel, containing beer bottle fragments, acorns (10930), and animal bones (10929).

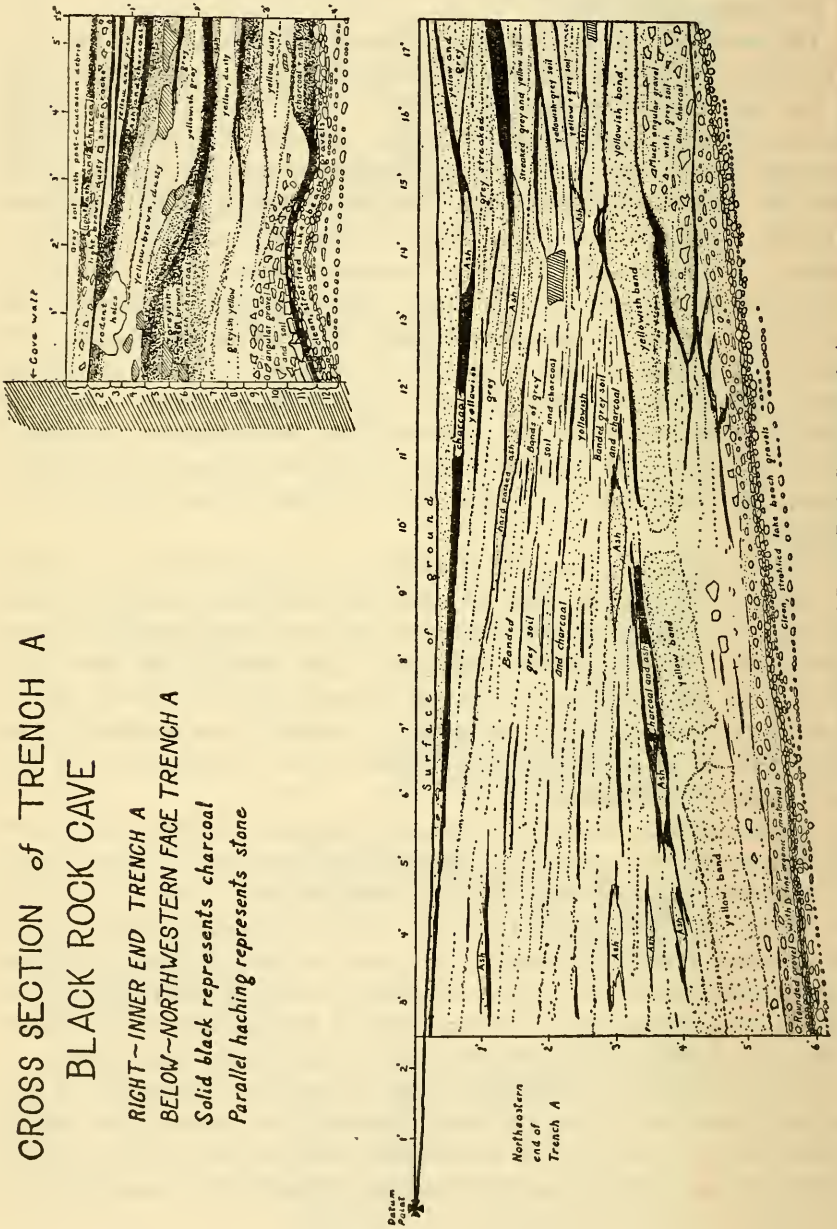


FIGURE 45.—Cross section of Black Rock Cave, trench A.

4″ to 8″ deep, banded ash and charcoal; a well-defined fire level at a depth of 8″. Contained acorns (10933), miscellaneous broken animal bones (10931), and artifacts.

8″ to 10″ deep, banded ash, soil, and charcoal. Contained a flint dart point at 3a (fig. 44), miscellaneous animal bone fragments (10934), and artifacts.

10″ to 14″ deep, much ash throughout; a fireplace with 2″ of hard-packed ash at 4c. Contained 3 complete quartzite dart points at 4a and 4b, miscellaneous animal bone fragments (10945), and artifacts.

14″ to 19″ deep, charcoal, ash, and much rock in large pieces near the rear end of the trench; 2 inches of hard-packed ash at 5b. Contained a bird-bone awl at 5c and miscellaneous animal bone fragments (10958).

19″ to 24″ deep, much rock, e. g., at 6a; a deposit several inches deep of fine, slightly gritty yellowish substance, perhaps dung, at 6b. Animal bone fragments (10971) and artifacts rare.

24″ to 29″ deep, soil is moister and more sticky than above; at 7a and 7b, rocks project from layer below; charcoal and ash throughout. Contained miscellaneous animal bone fragments (10977) and artifacts.

29″ to 32″ deep; northwestern part of trench had much charcoal and ash. Contained artifacts and charred wood.

32″ to 36″ deep. Charcoal and ash beds in northwestern corner of trench; charcoal and ash throughout, but much rock at other end of trench. Contained a few animal-bone fragments (10986), a quartzite dart point at 9a, and other artifacts.

36″ to 40″ deep, ashes and charcoal scattered throughout, but artifacts rare. Contained animal bone fragments (10992) and artifacts.

40″ to 45″ deep. Much charcoal and ash (11001, 11003). Contained a few animal bone fragments (10997, including a small rodent jaw at 11b, and a skull fragment at 11c), a flint point in hard ash at 11d, and other artifacts.

45″ to 49″ deep. Earth moister; charcoal and ash seams. Contained a few animal-bone fragments (11005, e. g., at 12b), a fragment of worked bone at 12a, and other artifacts.

49″ to 54″ deep. This comprised many angular rocks and some charcoal which rested on lake gravels (pl. 4, *c*). Rounded, bedded gravels were encountered under this stratum in the upper part of the trench. There is no question that these were washed by Lake Bonneville when it was last in the cave, for although the pebbles range from almost microscopic size up to 1″ in diameter, all are rounded (sample, 11024). The top 4″ to 6″ of these, however, are, throughout the cave, mixed with dust and decayed fibrous material, as if they had

been trampled, and foreign material introduced by the first occupants of the cave. Some charcoal, even, is mixed with them (pl. 4, *c*). Under these disturbed lake gravels are clean bedded gravels which lie just as the lake left them. This layer contained a few animal bone fragments (11013) and a few artifacts.

54″ to 60″ deep. Lacustrine gravels were reached at this depth only in the outer half of the trench, being 66″ deep at the outer end of the trench. This layer comprised very moist soil containing angular rocks and what is probably decayed organic remains. Charcoal continued down to lake gravels and in spots was cemented with dust into hard lumps (sample, 11021), probably by an ancient drip of water laden with lime from the ceiling. 14a is a large flat boulder on lake gravels. Contained a few animal bone fragments (11018), a flint fragment (11020), and a few artifacts.

An infant (11022) was buried 6″ deep in the lake gravel (pl. 5, *a*, *d*; fig. 45) in a grave which had been scooped out when the cave floor was not over 6″ above the gravels, for the strata were unbroken 6″ above the gravels. The grave was thus 12″ deep. The infant lay on its left side, with its head toward the southeastern wall, its arms stretched by its side, and its legs flexed. It was accompanied by a dagger-like worked bone (11023). The bones, except the tibia, which is $3\frac{15}{16}$″ long, were too disintegrated to measure, but the individual must have been under 1 year of age.

Stratification in trench B was:

Surface to 4″ deep. Post-Caucasian remains. Contained one animal tooth (11026).

4″ to 9″ deep. Soil is very fine yellow dust. A fireplace at 2a, with rocks and charcoal. Contained animal bones (11029), potsherds at 2b, 5″ deep (11028).

9″ to 13″ deep. This reached lake gravels at 10″ deep at the inner end of the trench. Contained animal bone fragments (11030) and one potsherd.

13″ to 16″ deep. At 4a, a hard-packed bed of charcoal rested on rounded, stratified lake gravels. Contained animal bone fragments (11032) and an obsidian implement.

16″ to 21″ deep. Contained much charcoal and ash, but level comprised mostly yellow dust.

21″ to 23″ deep. Contained animal bone fragments (11035) and artifacts.

23″ to 29″ deep. A layer of ashes 3″ thick at 7a. Contained animal bone fragments (11040) and artifacts.

29″ to 32″ deep. Much rock in this level which rested on lake gravels. Contained animal bone fragments (11043), a charred stick (11046), and artifacts.

Against the southeastern wall of trench B, 35 feet from the cave mouth, a pit, 3′ 5″ in diameter NE–SW; 2′ 8″, NW–SE, was dug into the lake gravels, here only 1 foot deep, from a surface but a few inches above the gravel (pl. 5, *b;* fig. 43). It was dug so that the cave wall formed one side, the other sides being crudely lined with slabs, and had been sunk 11″ into the lake gravels. It contained nothing.

A skeleton had been buried in the NW part of trench B (pl. 5, *c;* fig. 44). The grave was dug from a surface 6″ above the lake gravels. A stratum of charcoal, 2′ 2″ below the ground surface, continued unbroken 3″ over the body. The skeleton lay on its back, its head northwest, its arms extended by its side. The skull was entirely gone and the legs were missing, but scattered toe bones in trench B probably belong to this skeleton. The grave contained a polished soapstone object (fig. 48, *e*) on the left shoulder, a quartzite scraper, a well-shaped bone awl point on the right pelvis, a bird-bone bead, and a flint chip which had been used on the edges for cutting.

Pottery.—The pottery from the Black Rock Cave is, in all essential features, like that from the Promontory caves. The paste is usually quite sandy and varies from dark brown to black. The temper is coarse white quartz or gravel, which stands out distinctly against the dark clay; occasionally some mica is used. In a few sherds the temper projects through the surface a little. The inner surface is uneven, though somewhat smoothed. The exterior is frequently polished with a pebble, but is slightly undulated, and is almost always black. Thickness ranges from $\frac{5}{32}$″ to $\frac{5}{16}$″ and averages about $\frac{3}{16}$″.

The great part of the pottery came from near the surface, that is between 4″ and 8″ deep, or just under the refuse which is largely post-Caucasian. This depth yielded 27 sherds (10932, 24 from trench A, and 11028, 3 from trench B). 10932 includes the only rim sherd from the entire cave, one from a plain vertical collared olla. 11028 includes two sherds which bear traces of red paint on the *inside* surface.

Trench A, 8″ to 10″ deep, yielded 4 sherds (10944) which are typical, except one which has a somewhat reddish exterior. From 10″ to 14″ deep came a single gray sherd (10995) which has a fine, dark temper, including some quartz, is well smoothed inside and polished outside, and resembles the puebloan pit lodge ware more than anything else. Below this depth, trench A contained no pottery, but a round pellet of unbaked clay (10985, fig. 48, *a*) 1″ in diameter, $\frac{3}{16}$″ thick, was found between 2′ 5″ and 2′ 8″ deep and several lumps of pinkish clay (11011) came from between 3′ 9″ and 4′ 1″ deep.

Trench B yielded, between 9″ and 13″ deep, 1 sherd (11031); between 16″ and 21″ deep, 2 sherds (11034); and between 23″ and 29″

deep, 2 sherds (11042), all of which are typical of the cave ware. Between 16″ and 21″, however, was 1 sherd (11034) which is finer and thinner than the others and greatly resembles puebloan pit-lodge pottery. 1 sherd (11044) from between 29″ and 31″ deep somewhat resembles puebloan ware, but is blacker, rougher, and tempered with some mica. The occurrence of these sherds at greater depths in trench B than in trench A has no great significance, however, for trench A was much better stratified. And the resemblance of certain sherds to puebloan ware may be simply fortuitous variants from the standard cave ware.

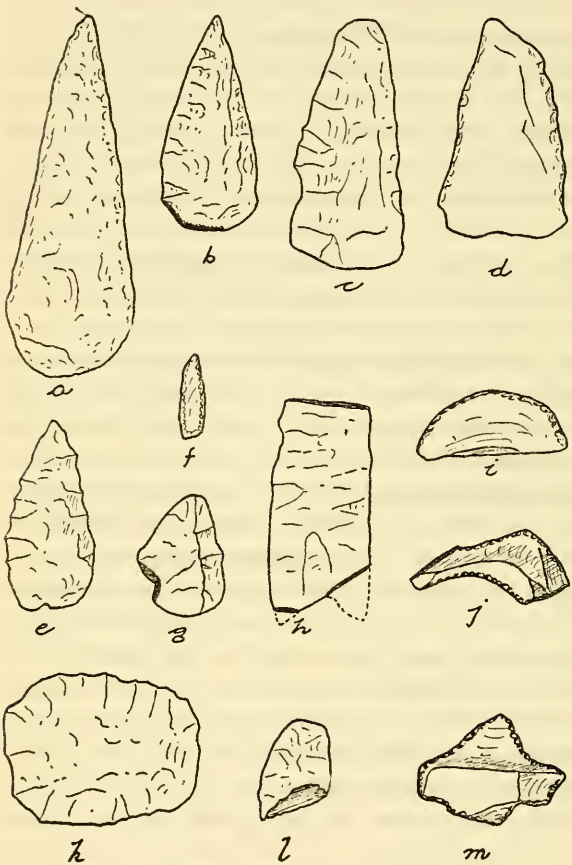


FIGURE 46.—Stone knives and scrapers from Black Rock Cave.

KNIVES AND SCRAPERS.—30 specimens of knives and scrapers were obtained from the Black Rock Cave. Materials used include flint, obsidian, and a distinctive kind of quartzite.

The only observable stratification of these is a preponderance of beautifully worked leaf-shaped points or knives in the latest culture, above 19″ deep.

The leaf-shaped blades resemble the knives associated with the pottery culture in the Promontory caves, except that their butts are rounded rather than straight. One of these, 11072 (fig. 46, *a*), was found with a burial in the back part of the cave, associated with a side-notched arrow point which marks it as belonging to the pottery culture. It is 4½″ long, ¼″ to 5/16″ thick, and is excellently worked of gray, streaked flint. Another (11025, fig. 46, *b*) came from trench B between the surface and 4″ deep. It is well shaped of brownish flint and is 2¾″ long, ¼″ thick. The butt is rounded, like 11072, but is distinctly worn on one side.

Trench A, 8″ to 10″ deep. Two blades (10935 and 10936, fig. 46, *c*, *d*) are of quartzite like that used for dart points in this and lower strata. 10935 is rather crudely chipped, 3⅛″ long, ¼″ to ½″ thick. 10936 is a flake 2¾″ long, with slightly retouched edges. 10939 is a crude thick core of brownish flint, the edges of which were probably used to some degree for scraping.

10″ to 14″ deep yielded four scrapers. Two (10956) are irregular flakes of obsidian, the edges of which are slightly retouched. Two (10953) are unworked flakes of quartzite which may have been used as scrapers.

14″ to 19″ deep, or below the pottery, yielded one knife and several scrapers. 10959 (fig. 46, *e*) is a knife of gray, spotted flint, 2⅜″ long, 3/16″ thick. 10961 is a crudely chipped dart or knife point of quartzite. 10962 is an unfinished quartzite blade. 10964 (fig. 46, *f*) is a flake of white flint, 1 1/16″ long, 1/16″ thick, the edges of which are retouched from one surface only. Some of the many quartzite chips (10965) found here may have served as scrapers.

19″ to 24″ deep contained a single unworked flake of gray chert (10972), the edges of which were not retouched but show wear.

24″ to 29″ deep had a single broken knife or scraper (10978–1, fig. 46, *g*) crudely worked of dark-gray flint, 1½″ long, ¼″ thick. Also miscellaneous chips of flint, obsidian, and quartzite (10978).

32″ to 36″ deep yielded one blade fragment and several flakes used as scrapers. 10989 is the fragment of a gray flint blade having a rounded end. 10989 also includes a small flake of gray flint, one edge of which has been retouched from one surface. 10990 includes two fragments of quartzite, two of gray flint, two of deep red flint, and one of obsidian, several of which were probably used as scrapers.

36″ to 40″ deep had the only drill (10996) in the cave. It is a point of white flint, 1⅝″ long, ¼″ to 5/16″ wide, having a tapering sharp point but broken at the butt end.

45″ to 49″ deep had one knife and one flake scraper. The knife (11009, fig. 46, *h*) is a beautifully chipped blade of a fine grade of deep brown flint. It is 2⅝″ long, broken at each end, and ¼″ thick. Its base seems to have had a single deep notch cut in its center. The scraper (11007, fig. 46, *i*) is a flake of white flint one edge of which is retouched.

54″ to 60″ deep yielded a single scraper made by slightly retouching a flake of dull obsidian (11020). This resembles somewhat an end scraper.

Trench B, 23″ to 29″ deep, yielded the rounded end of a broken knife or scraper of red flint (11041–1, fig. 46, *l*), 1⅜″ long. Another knife or scraper (11041–2) is a blade of very dark flint, 2½″

long, 1½″ wide, 5/16″ thick, each end of which is broken but which seems to have been pointed at one end.

29″ to 32″ deep contained a scraper (11045, fig. 46, *m*), made by retouching from one surface all the edges of a flake of almost transparent obsidian.

The burial in trench B contained two scrapers. One of these (11065, fig. 46, *k*) is of gray quartzite skillfully flaked on both surfaces to form a more or less rectangular blade with a sharp edge all the way around. It is 2⅜″ long, 1⅞″ wide, ⅜″ to ½″ thick. The other (11068, fig. 46, *j*) is a very irregular flake of gray flint, the sharp edges of which are retouched mainly from one surface.

Trench C is of little importance stratigraphically, but from between the surface and 9″ deep came two unworked flakes of gray quartzite (11052) the edges of which show wear.

Projectile points.—Stratification reveals a definite sequence of projectile points. The earliest culture, trench A, 45″ to 54″ deep, has only small dart or arrow points. Next, through the greatest part of the deposit, trench A, 10″ to 36″ deep, the predominating form is a quartzite dart point with a more or less flat base and notches cut from the corners of the butt. This may be correlated with the broad, corner-notched points of Promontory Cave No. 2, although the latter are shorter and are never made of quartzite. The latest point is the side-notched and sometimes base-notched arrow point which is associated in the Promontory caves and elsewhere with the cave type of pottery.

Surface specimens. 11073 (fig. 47, *a*) is an excellent example of the late type of arrow point, and was associated with the knife (11072) and burial in the back of the cave. It is skillfully chipped from a curved flake of obsidian 1½″ long.

Trench A, 8″ to 10″ deep, yielded one typical quartzite dart point (10937, fig. 47, *b*), 1½″ long, 3/16″ to ¼″ thick. 10938 is the fragment of a somewhat similar crude point of dark brownish flint.

10″ to 14″ deep had three complete typical quartzite dart points (10949, 10950, and 10948, fig. 47, *c*, *d*, *e*), and two tips (10951 and 10952) probably of similar points. 10949 is of light grayish tan quartzite, 1¾″ long, 3/16″ thick. 10950 is of purplish quartzite, 1⅞″ long, 3/16″ thick. 10948 is of purplish quartzite, 2 1/16″ long, 3/16″ thick, and is somewhat crooked, being less completely shaped than the others.

14″ to 19″ deep yielded two butts (10960 and 10963, fig. 47, *f*, *g*) of typical dart points. 10960 is expertly chipped of gray quartzite and must have been originally close to 3½″ long as the butt is 1⅝″ long. It is 3/16″ thick. 10963 is the butt of a somewhat similar, though crude, point of pinkish flint, now 1⅛″ long, 5/32″ thick.

Between trenches A and B, 20″ deep, was a small dart or arrow point (11047, fig. 47, *h*) of brown flint, 1¼″ long, 3/16″ thick.

Trench A, 19″ to 24″ deep, contained the butt of a typical dart point (10973, fig. 47, *j*) of purplish gray quartzite, 1¼″ long, 7/32″ thick. The only arrow point(?) (10976, fig. 47, *i*) from these intermediate levels was also found here. It is well worked of obsidian, 1 3/16″ long, 3/16″ thick, and is distinguished from the points of the pottery culture in being base and corner notched.

29″ to 32″ deep had an obsidian dart point (10984, fig. 47, *k*) of unique form. It is crudely made and has slight protrusions at the shoulders just above the tapering stem. It is 1¾″ long, ¼″ thick.

32″ to 36″ deep had two typical dart points (10840 and 10839, fig. 47, *l*, *m*) of gray quartzite. 10480 is 1 7/8″ long, ⅛″ thick; 10839 is 2″ long, 3/16″ thick; both are well made.

40″ to 45″ deep yielded only the much-worn tip of a well-chipped point of brown flint (10999).

45″ to 48″ deep had only a small, leaf-shaped point of white flint (11008, fig. 47, *n*). It is 1⅜″ long, ⅛″ thick, and has a rounded base; perhaps a knife.

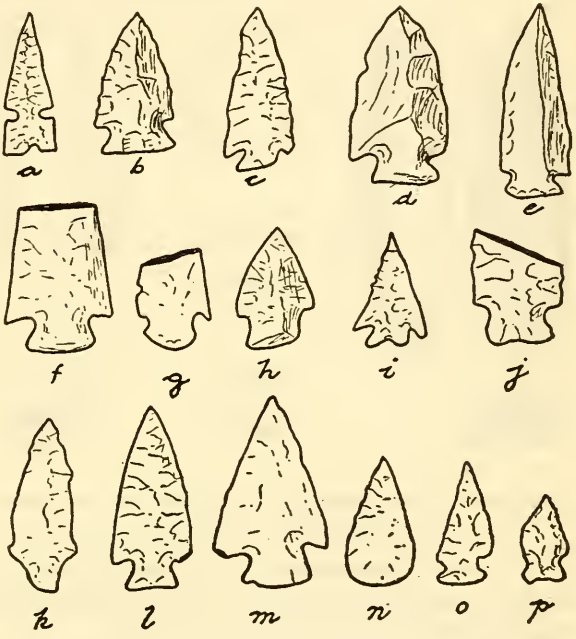


FIGURE 47.—Projectile points from Black Rock Cave.

49″ to 54″ deep had two points (11014 and 11015, fig. 47, *o*, *p*) which, judging from their size, might be regarded as arrow rather than dart points. 11014 is fairly well chipped from a crooked flake of brown and gray flint, is 1¼″ long, ⅛″ thick, and has crude side notches. 11015 is very crudely made of obsidian, 7/8″ long, 3/16″ thick.

OBJECTS OF BONE, HORN, AND SHELL.—Trench A, 8″ to 10″ deep, contained a point (10940), probably an awl, worked from a splinter of bone, and a small piece of worked bone (10943).

10″ to 14″ deep yielded the tip cut from an antler (10947). A broken bone implement (10946, fig. 48, *c*) is 1 7/8″ long, 3/8″ wide, 3/16″

thick, and has a chisel-like point. A ring cut from abalone shell (10957, fig. 48, *e*) is 1 1/16″ outside diameter, 7/16″ inside diameter, 1/16″ thick. Also a bone joint which has been cut off (10945–19).

14″ to 19″ deep yielded an awl made of bird bone (10969) and 2 awls made of bone splinters (10958, 10968).

19″ to 24″ deep yielded an awl made of bone splinter (10974).

24″ to 29″ deep contained a fragment of polished bone (10979).

29″ to 32″ deep yielded a bone awl (10981).

32″ to 36″ deep contained a charred awl made from a splinter of bone (10988), a bead (?) made by cutting off the ends of a bone (10987, fig. 47, *f*)—possibly these ends were gnawed—leaving it 9/16″ long, 3/8″ to 1/2″ in diameter.

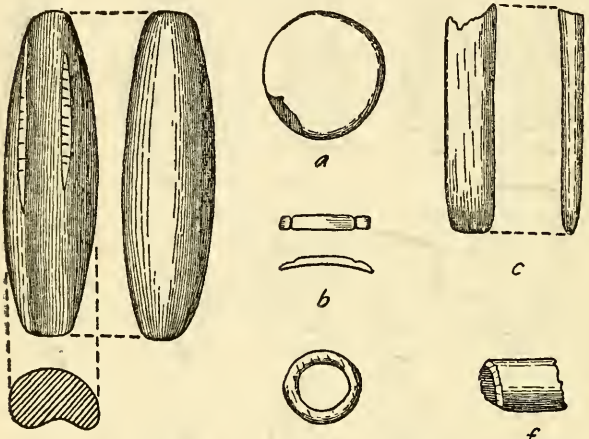


FIGURE 48.—Objects of clay, shell, bone, tooth, and stone from Black Rock Cave.

36″ to 40″ deep contained two awls (10994, 10995) made from splinters, each having a hollow worn on its side, and another awl made from a bone having the joint left on as butt (10993).

40″ to 45″ deep contained an awl made from a bone splinter (10998).

45″ to 49″ deep contained a large fragment of worked bone (11006) and a bone chip (11075) which may be a hand-game stick. It is 3 1/16″ long and has rounded ends and edges.

49″ to 54″ deep contained no bone artifacts.

54″ to 60″ deep contained an awl (11019) made from a splinter of bone. With this level also should be included the dagger-like bone implement (11023, pl. 5, *d*), which accompanied the infant burial. The object, 9 1/4″ long, seems to be made from the bone of a very large bird. One end has the joint cut off so as to be square; the other tapers to a long, very sharp point; the whole is highly polished.

Trench B, 21″ to 23″ deep, contained 3 beads (11039–1, –2, –3) made by cutting the ends of bird bones square, leaving them as hollow tubes. Two of these are 2 3/8″, the third 2 7/8″ long. Two awls (11036, 11037) are made of bones with the joints left on one end and are respectively 5 1/2″ and 5 3/4″ long.

In trench B with the burial was a well-made bone awl (11067), having the joint, which was somewhat trimmed and smoothed, left as butt, and a bird-bone bead (11066) like those above, 3⅞″ long.

From trench C, between the surface and 9″ deep, came the incisor tooth of a small rodent (11051, fig. 48, *b*), ¾″ long. It has a small transverse groove on the outer surface ⅛″ from each end. This may have been a die for gaming or an ornament.

In the rear of the cave, about 150 feet from the entrance, in the upper few inches of earth containing disturbed human burials, were several bone awls, which probably belong with the pottery culture: 11071, 6″ long, having the joint for a butt; 11062–1, 3⅞″ long; 11062–2, 4 7/16″ long; 11062–3, 6½″ long. There was also a sharpened bone (11061), 8 15/16″ long.

125 feet from the cave entrance, about 30″ under large boulders which had slipped off the northwestern wall, was a bone splinter (11048), 2⅞″ long, trimmed to a point, which was probably used for flint flaking.

Shells.—Identification of these shells was made by Dr. Elmer G. Berry, of the Department of Zoology, University of Utah.

Trench A, 14″ to 19″ deep. One specimen of unworked "clam", *Margaritana margaritifera* Linn. (10967). Also one snail, *Physa ampullacea* Gould (sinistral shell) (10970).

19″ to 24″ deep. Specimen of *Oreohelix haydeni gabbiana* Hemph (10975).

24″ to 29″ deep. Specimen of *Margaritana margaritifera* Linn. (10040–4).

29″ to 32″ deep. Specimen of *Oreohelix haydeni gabbiana* Hemph (10982) and of *Oreohelix haydeni utahensis* Hemph (10982).

32″ to 36″ deep. 4 unidentified snail shells (10991).

40″ to 45″ deep. Specimen of *Oreohelix haydeni utahensis* Hemph (11000).

45″ to 49″ deep. Specimen of same (11010).

49″ to 54″ deep. Specimen of same (11016).

Trench B, 4″ to 8″ deep. Fragment of "clam" shell (11029).

29″ to 32″ deep. Two fragments of "clam" shells (11043), one having traces of red paint.

Miscellaneous objects.—Trench A, 10″ to 14″ deep, contained 2 water-worn limestone pebbles (10954), each about 1½″ to 2″ in diameter, having a slightly concave side with a high polish, as if it had been used for pot polishing. 10966 is a rounded pebble.

14″ to 19″ deep yielded a rounded, slightly elongated water-worn limestone pebble, 2¼″ in diameter, about 1½″ thick, one end of which showed slight evidence of hammering.

19″ to 24″ deep contained the only fragment of weaving found in the entire cave. This is a piece of matting (10972, fig. 13, *a*) woven of tule with an open diagonal twine. The warps are spaced widely apart, 3 per inch. The weft, which is a pair of tules, twisted clockwise, is spaced at irregular intervals. Near the top edge of the fragment three strands are braided across in place of the usual pair of twining elements.

With the burial in trench B was a highly polished object of steatite or fine slate (11064, fig. 48, *d*), the use of which is uncertain but which resembles an arrow straightener more than anything else. It is 2⅝″ long and more or less oval in cross section, being ¾″ by ½″ in diameter in the center and tapering to 5/16″ by ¼″ at each end. A groove, ¼″ wide and 3/32″ deep, runs its entire length. Small striations, left by the implement employed in smoothing it, run longitudinally.

Fauna: *Mammals.*—Dr. Edwin H. Colbert, of the American Museum of Natural History, after a general examination of the mammalian bones from the Black Rock and Promontory Caves, writes: "The fauna is a characteristic assemblage of western plains or foothills mammals . . . closely comparable to the existing species in the western area. I have shown the collection to Dr. H. E. Anthony, Curator of Mammals at this Museum, and he feels as I do about the specimens, namely, that they may all be referred to existing species."

Identifications of specimens made by Dr. G. S. Miller, of the United States National Museum, show that mountain sheep (*Ovis canadensis*) and the mule deer (*Odocoileus hemionus*) were most abundant, specimens of the former occurring in trench A to a depth of 40″ and the latter to a depth of 60″. The pronghorn (*Antilocapra americana*) occurred in trench A only at 10″ to 14″ deep and 14″ to 19″ deep. Two specimens of bison (*Bison bison*) came respectively from 14″ to 19″ deep and 24″ to 29″ deep in trench A and from 13″ to 16″ deep in trench B. One specimen of grizzly bear (*Ursus* sp.) occurred at 40″ to 45″ deep in trench A. Jack rabbits (*Lepus* sp.) and woodchucks (*Marmota flaviventris engelhardti*) were fairly common. The first was found from the surface to a depth of 32″ in trench A and from the surface to a depth of 32″ in trench B, being especially common between 8″ and 10″ deep. The woodchuck was found on the surface and in trench A to a depth of 45″. Trench B yielded one specimen of woodchuck at 8½″ deep.

The presence of the dog, as in Promontory Cave 2, is doubtful. 4 specimens, 3 from near the human burials 125′ back from the mouth of the cave and 1 from trench A between 14″ and 19″ deep, may have been dogs.

FAUNA: *Birds.*—The following species of birds, identified by Dr. Alexander Wetmore, of the United States National Museum, are represented:

Cormorant (*Phalacrocorax auritus*). Trench A, 8″ to 10″ deep.

American widgeon (*Mareca americanus*). Trench A at depths of 19″ to 24″, 24″ to 29″, and 29″ to 32″ (4 specimens). Trench B at 4″ to 8″ deep and 29″ to 32″ deep.

Duck (*Anatidae* sp.). Trench A, 19″ to 24″ deep, 2 specimens. Trench B, 23″ to 32″, 2 specimens.

Golden-eye duck (*Glaucionetta clangula americana*). Trench A, 45″ to 49″ deep, 1 specimen.

Turkey buzzard (*Cathartes aura*). Near burials in rear of cave, 2 specimens.

Red-tailed hawk (*Buteo borealis*). Near burials in rear of cave, 1 specimen. Trench A between surface and 4″ deep, 1 specimen.

Ferruginous rough-legged hawk (*Buteo regalis*). Trench A, between 14″ and 19″ deep, 1 specimen.

Golden eagle (*Aquila chrysaetos*). Trench A, 32″ to 36″ deep, 1 specimen.

Duck hawk (*Falco peregrinus*). Trench A, surface to 8″ deep, 2 specimens.

Prairie falcon (*Falco mexicanus*). Rear of cave, near burials, 1 specimen.

Sage grouse (*Centrocercus urophasianus*). Trench A, between 29″ and 32″ and between 54″ and 60″ deep, 1 specimen each.

Dusky grouse (*Dendragapus obscurus*). Rear of cave near burials, 1 specimen. Trench A, between 29″ and 32″ deep and between 49″ and 54″ deep, 1 specimen each.

Grouse (*Tetronidae* sp.). Trench A, 10″ to 14″ deep, 1 specimen.

Raven (*Corvus corax*). Trench A, 14″ to 19″ deep, 1 specimen.

HISTORY OF BLACK ROCK CAVE

As a very tentative guess, it may be supposed that Lake Bonneville receded to the Stansbury level about 10,000 years ago. As the Black Rock Cave lies 364 feet above Great Salt Lake, or approximately 60 feet above the Stansbury terrace, it may have been left dry and habitable 10,000 and possibly 15,000 years ago. That it actually was occupied soon after it became habitable cannot be doubted, for no accumulation of any kind intervenes between the lacustrine gravels and culture-bearing strata to show a time lapse between the recession of the lake and its first use by human beings; in fact, evidence of human occupation in the form of charcoal is mingled with the gravels. Even should the more conservative esti-

mate of the antiquity of the oldest cultures be reduced by as much as several thousand years, there is no question that they are, as American antiquities go, exceptionally old, and antedate by some thousands of years the earliest known Basket Maker period of the Southwest.

Unfortunately, these early cultures cannot be fully characterized. A review of the stratification of artifacts, however, suggests that they did not remain uniform throughout the cave's history, but that three more or less distinct periods are represented. These data are tabulated below.

Stratification of Black Rock Cave, trench A

Depth	Pottery	Small projectile points	Quartzite dart points	Retouched flake scrapers	Nonretouched flake scrapers	Chipped knife blades	Bone-splinter awls	Miscellaneous bone objects
Promontory culture:								
4″ to 10″	32	0	1+?	0	1	2	1	1
Black Rock culture:								
10″ to 14″	2	0	5	2	2	0	0	2
14″ to 24″	0	2	2	1	1+?	2	3	1
24″ to 32″	0	0	1?	0	0	1	0	1
32″ to 36″	0	0	2	1	5	1	1	1
Early period:								
36″ to 45″	0	0	1?	0	0	0	3	1
45″ to 54″	0	2	0	1	0	2	0	2
54″ to 72″	0	0	0	1	0	0	1	0

The earliest culture represented in Black Rock Cave, that with which the infant burial was associated, lay in the lowest 2 feet of refuse between the depths of 3 and 5 feet. Its only significant features appear to be the complete absence of quartzite dart points, which are common at higher levels, and the use instead of a projectile point which is so small that it resembles modern arrow points. The lack of the quartzite dart points, however, may be due simply to the general scarcity of specimens. Other artifacts include knives, retouched flakes used as scrapers, and bone-splinter awls. The absence of end scrapers and other implements of well-known types which were found at Signal Butte, Nebr., and the Lindenmeier Folsom site [62] in Colorado could be explained merely by the paucity of materials here. There is nothing specific, however, to equate anything in the cave cultures to Signal Butte, or the Lindenmeier, Folsom, or Clovis sites.

The greater part of the deposits, that lying between 10 inches and 3 feet deep, seemed to contain a single culture, the most conspicuous feature of which is a distinctive style of corner-notched projectile point of gray or reddish quartzite. We shall call this the Black Rock culture. Other artifacts, however, are like those previously

[62] Roberts, 1935.

mentioned from the lower strata and include a few small points of obsidian. The leaf-like flint knife, which is widest near its rounded butt, appears to be shared by this culture and the overlying Promontory culture. The proportions of all these blades are similar to those found in the Pinto Basin, California,[63] which may or may not be significant.

From between 4 and 10 inches deep came abundant pottery representing the Promontory culture. Only one quartzite dart point was found here, and although arrow points were not associated in this cave with pottery, we know from the evidence in the Promontory Point caves that the bow was used. Other artifacts from 4 to 10 inches deep are like those found at all depths. It is not certain whether the arrow point, the large, beautifully worked knives, and the bone awls found near the surface in the outer part and mixed with scattered burials in the inner part of the cave belong with the Promontory culture or are modern Shoshonean; or, in fact, whether the Promontory culture is actually Shoshonean. Post-Caucasian objects were not definitely associated with any of the artifacts.

GENERAL CONCLUSIONS

The difficulties in the way of correlating the data from the caves, especially the Promontory Cave No. 2 and the Black Rock Cave, with one another and with cultures in other regions are so great that it is well-nigh impossible at the present time even to give a tentative reconstruction of the major features and sequence of cultures in the Great Salt Lake region. The most serious and almost insuperable difficulty is the very great paucity of artifacts from the earlier periods. At the risk, however, of setting forth hypotheses which future research will modify, we shall attempt to synthesize our data.

Certain peculiar and somewhat negative facts should first be mentioned. First, as not a single artifact from any cave is associated with post-Caucasian objects, there is no certainty that the modern Shoshonean tribes of the region ever left important remains in these caves.[64]

Second, with the exception of the painted petroglyphs in Cave No. 1, there is very little suggestion of Basket Maker or Pueblo cultures in any cave. Not only is this a serious loss to stratigraphy, as it deprives us of excellent means of dating certain of the cultures, but it is puzzling, for as the Basket Maker and Pueblo have endured 3,000 years or longer in the Southwest, during part of which at least the caves must have been occupied, one might reasonably expect to

[63] Amsden, 1935, pp. 40–43.

[64] The writer has examined many caves known to have been used by Shoshoni but he failed to find any identifiable Shoshoni objects. The scarcity of objects at most Shoshoni sites is striking.

find some trace of them in the caves. Even in Lovelock Cave, in western Nevada, there are definite though restricted Basket Maker features in the early period.[65] The only other possible trace of Basket Maker influence in the Black Rock Cave is the quartzite dart point, which, however, is corner-notched, whereas the Basket Maker point is side-notched. A few of the points from various depths of Cave No. 2 are only slightly more like the latter.

Third, there is no great similarity in the early cultures of the Black Rock and Promontory caves, despite the reasonable assurance that the sites were in some measure occupied contemporaneously. End scrapers are common in Cave No. 2 at all depths and slate blades which occur in stratum 3 are not known from the Black Rock Cave, whereas quartzite dart points, which are so characteristic of the Black Rock Cave, were not found in Cave No. 2, unless the broad, corner-notched points of flint and obsidian, which were especially common between 2 and 3 feet deep and associated with some pottery, are actually the same point in a different material.

In short, the two caves do not harmonize and each seems to show serious gaps where a culture is represented in the other. Bearing in mind these difficulties, we shall proceed with a reconstruction, starting with the most recent culture.

The latest occupants of all the caves investigated had the Promontory culture. This is characterized by the self and sinew-back bow, cane arrows with hardwood foreshafts, longitudinally grooved stone arrow polishers, "fingernail" and rim decorated pottery, cedar bark pot rests, three and four piece moccasins, extensive use of hide, single-rod or rod-and-bundle coiled basketry, tule and rush matting with cord twine, fur and feather cloth, triangular flint knives set in the ends of long wooden handles, and incised slate slabs. It is known from practically all caves around Great Salt Lake, from a mound in Provo, and possibly in the Uintah Basin. Although, on its face value, the fact of being stratigraphically highest argues recency, the failure of this culture to conform more closely to the modern cultures of the region indicates some antiquity. It cannot be positively attributed to modern tribes of the region, for it possesses a curious combination of traits of northern and southern origin. It could be early Shoshonean but it could also be that of any of several hunting tribes which were in contact with potters long enough to learn pottery making, but which did not learn horticulture. The culture in Lovelock Cave which was probably contemporary with this has remarkably few points of resemblance to it. The self and sinew-back bow, rush matting, fur cloth, and cane arrows with greasewood fore-

[65] Loud and Harrington, 1929, p. 121.

shaft are shared by each but are very common elsewhere.[66] Only single-rod coiled basketry may indicate a closer relationship.

Prior to the Promontory culture, the Black Rock Cave was occupied for a long time by people making quartzite dart points. Whether this was before, after, or contemporary with the Pueblo and Basket Maker cultures, we do not at present know. The correlation of this, moreover, with cave No. 2 is uncertain. If the two caves were occupied simultaneously this culture is probably represented by the broad, corner-notched points of flint and obsidian, practically all of which occur at the bottom of, or just under, the Promontory culture in Cave No. 2.

An interruption in the occupation of Cave No. 2 is indicated below this, but a corresponding period in Black Rock Cave is not seen. Preceding this temporary abandonment of Cave No. 2 is a period characterized by slate blades and swallowtail points. Although but 3 of the latter were found, they are very distinctive and resemble certain Lovelock Cave points of the early period[67] and the Pinto Basin points. Neither is represented in the Black Rock Cave.

The oldest culture of all is that lying in the lowest 2 feet of deposits in the Black Rock Cave, but it yielded too little to characterize it.

The early flints described in this paper and the forms of Lovelock Cave, Gypsum Cave, and the Pinto Basin probably indicate that west of the Rocky Mountains there developed a series of types of as yet undetermined sequence whose general pattern differed markedly during its early phases from the Folsom and related forms east of the Rocky Mountains.

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[66] Loud and Harrington, 1929, pp. 122–123.
[67] Loud and Harrington, 1929, p. 108.

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INDEX

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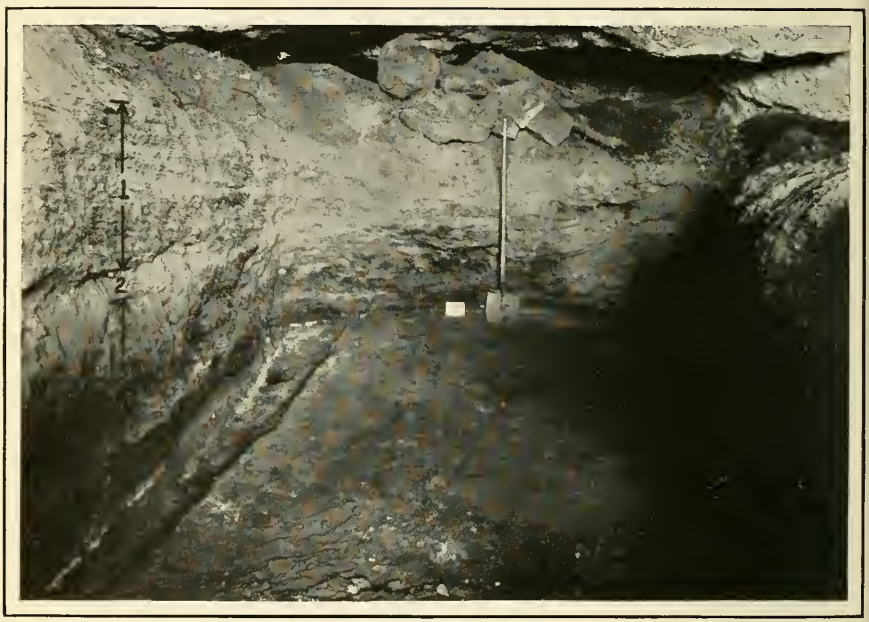
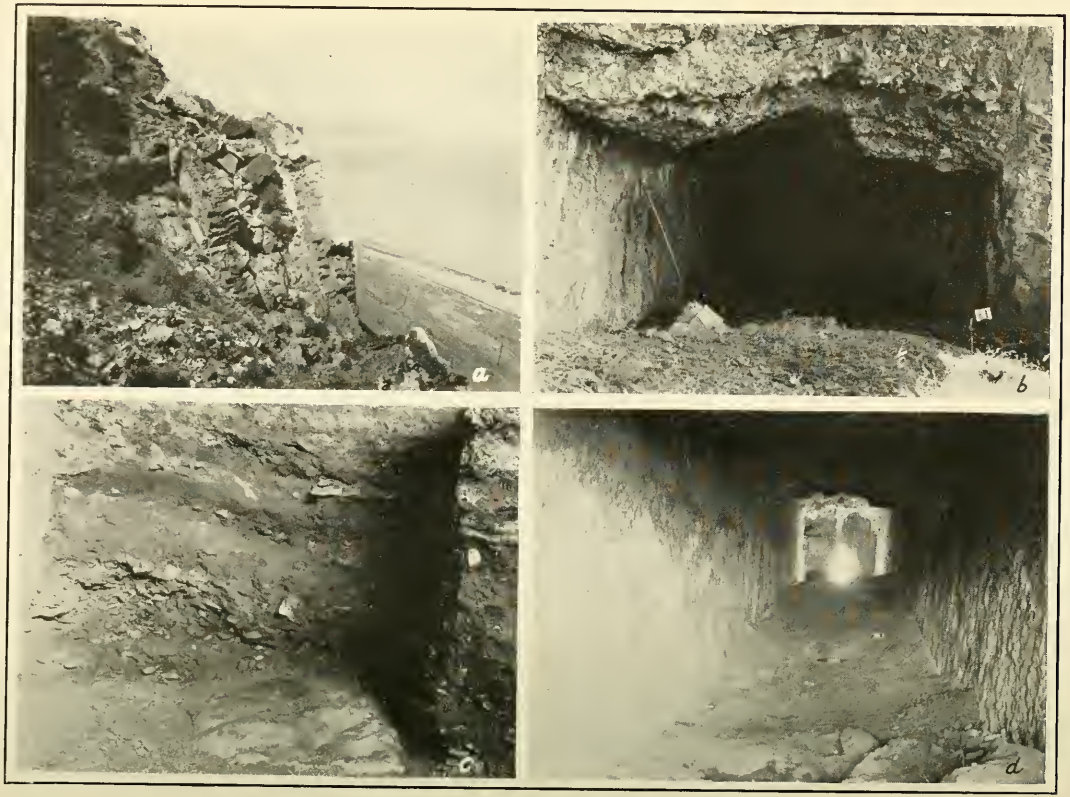
CAVES NOS. 1 AND 2, PROMONTORY POINT.



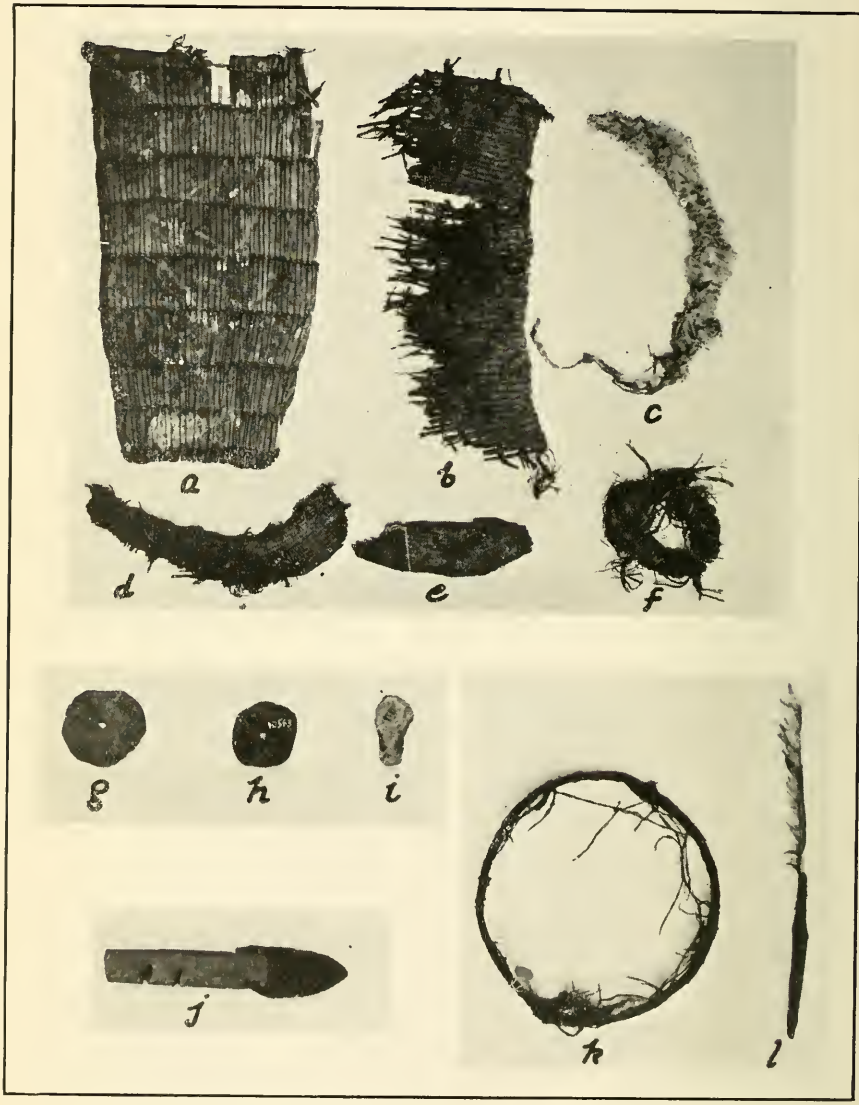
EXCAVATION IN CAVE NO. 2.

CAVES NOS. 3, 5, AND 6, PROMONTORY POINT.

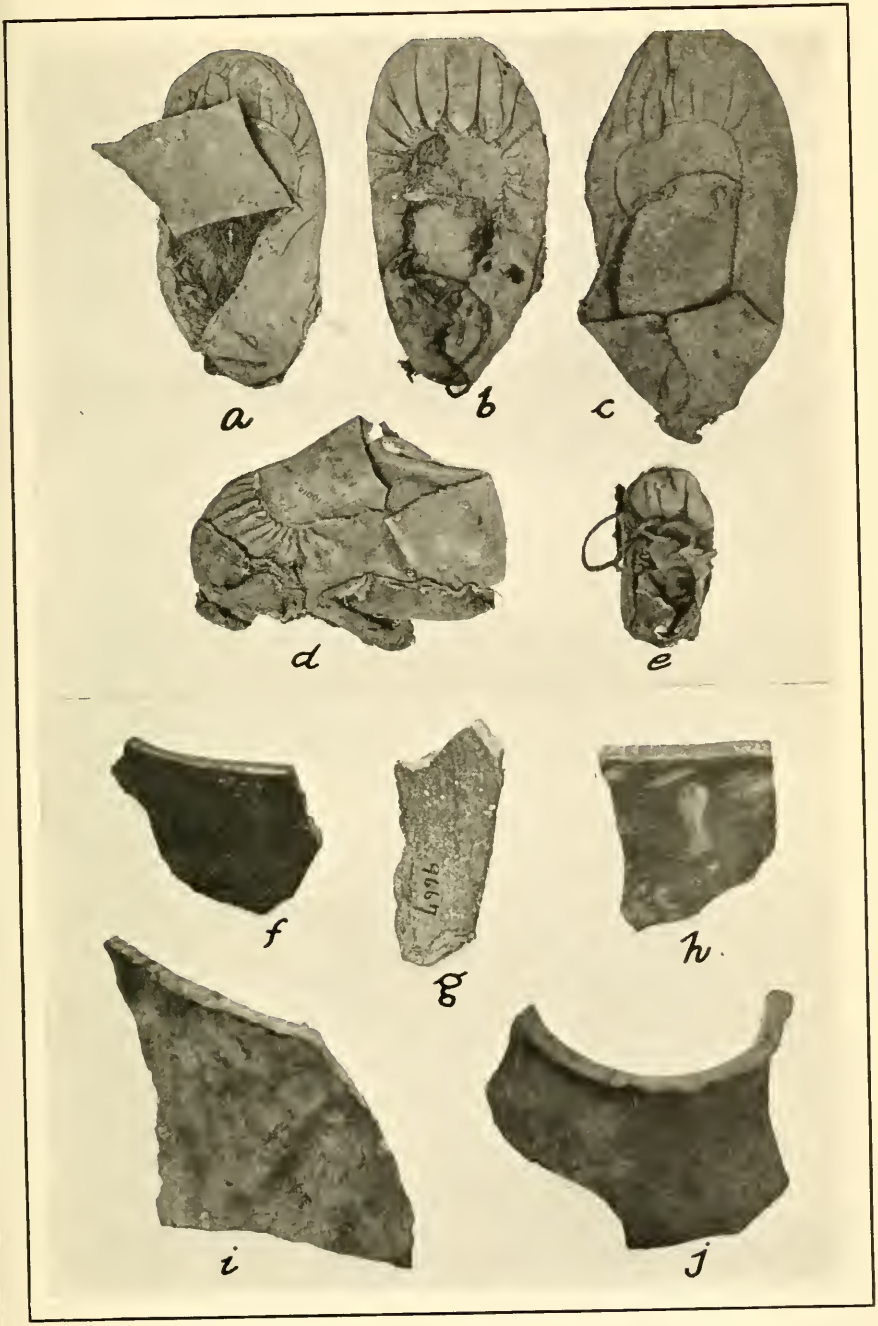


BLACK ROCK CAVE.

EXCAVATIONS IN BLACK ROCK AND PROMONTORY CAVES.



MISCELLANEOUS OBJECTS FROM CAVE NO. 1, PROMONTORY POINT.



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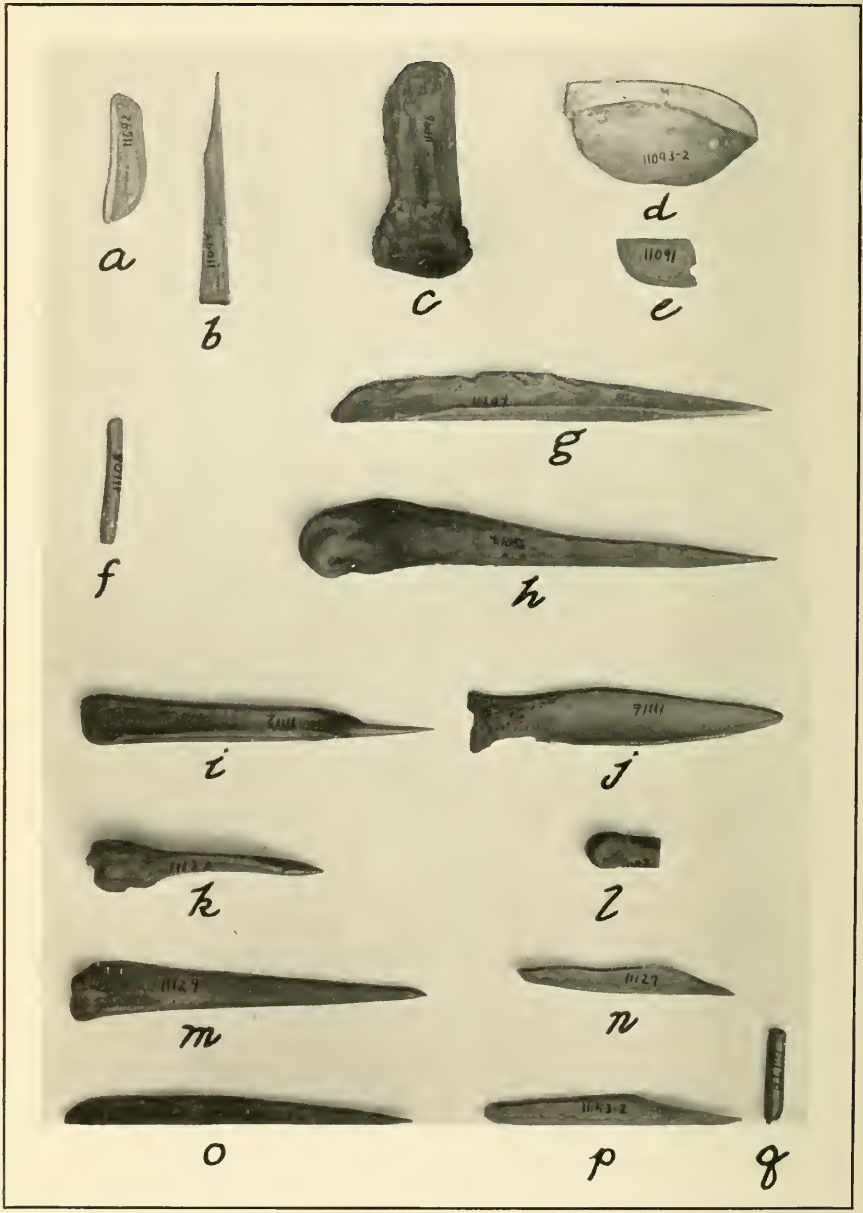
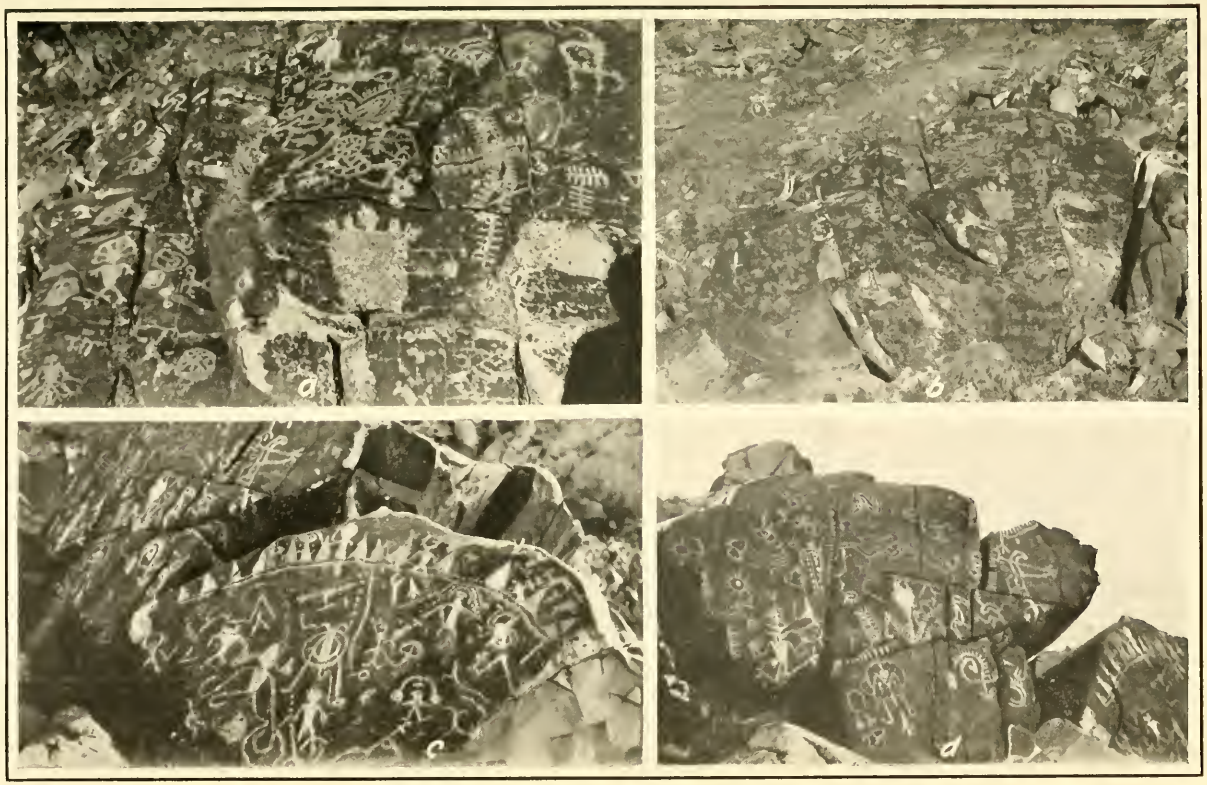


OBJECTS OF BONE FROM CAVE NO. 2, PROMONTORY POINT.



PETROGLYPHS NEAR CONNOR'S SPRINGS.