SPRING CREEK CAVE, WYOMING

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ABSTRACT

Spring Creek Cave, a single-component, habitation site in the Big Horn Basin near Ten Sleep, Wyoming, yielded an assemblage of stone artifacts diagnostic of the Late Middle Prehistoric period in context with a considerable variety of hitherto undescribed perishable items. Charcoal produced a radiocarbon date of A.D. 225 ± 200. The Spring Creek material considerably amplifies present knowledge of Late Middle period technology and economy in the Northwestern Plains and provides opportunities for comparison of Late Middle period perishable items with similar items in Basketmaker assemblages of the Southwest and in other assemblages from various parts of the Basin-Plateau region.

SPRING CREEK CAVE (48 WA 1) is a dry cave inside the bend of the Big Horn Mountains in northern Wyoming. It has produced a single level of occupation with material diagnostic of the Late Middle Prehistoric period. The Big Horn Basin is a syncline about 50 mi. wide and 90 mi. long that connects with the Northwestern Plains through a narrow gap to the north in Montana. Except for this gap, the basin is completely surrounded by mountains. To the east are the Pryor Mountains and the Big Horn Mountains which connect with the Owl Creek Mountains to the south. The Carter and Absaroka mountains form the western border. The entire Big Horn Basin is drained by the Big Horn River which, before entering the basin, is known as the Wind River. This river flows northward to the Yellowstone River in Montana.

Although the Big Horn Basin is considered an enclave of the Northwestern Plains, conditions are reminiscent of the Basin and Range Province further to the southwest. Rainfall is usually less than 7 in. annually at lower elevations. Great stretches of alkaline soil support mainly greasewood, shadscales, saltbushes, rabbit brush, and small sagebrush. In areas of better soil there is a sparse grass cover with some juniper and yucca. It is a typical badland topography relieved by many fertile river valleys that lie along live streams marked by stands of cottonwoods and willows.

Except for the narrow gap to the north, one approaches mountains in every direction. Rainfall increases rapidly with elevation and results in related changes in flora. The mountain front is dissected by deep, narrow canyons, many of which contain live streams and provide an environment that contrasts sharply with the nearby badlands.

THE SITE

The cave is in an area peripheral to the badlands, actually in a transitional foothill zone between the mountains and the badlands. It lies in the steep south wall of Spring Creek Canyon about 10 mi. southeast of Ten Sleep, Wyoming. The cave is about 600 ft. above the stream and 150 ft. below the canyon rim. Its opening faces directly north, and the cave proper extends horizontally for a distance of 150 ft. Elevation at the site is about 5900 ft.

Work at this site was carried on intermittently over a period of nearly four years, and much of this was accomplished during the winter of 1953–54 when snowfall was unusually light. Erosion at the cave entrance had exposed a culture-bearing stratum covered by sand and rockfall to depths varying from a few inches to nearly 3 ft. (Fig. 1). Prominent features of the occupational surface were two stone-ringed hearths with shallow pits; a mat, subrectangular in shape (6 by 8 ft.) constructed of small fir, sagebrush, and juniper branches covered with a layer of rye grass; a large pile of woodworking debris; and a natural protrusion of sandstone covered with numerous scratches and grooves. Most of the deposit inside the cave remains unexcavated, but test trenches revealed no occupation beyond the area near the entrance.

CHIPPED STONE ARTIFACTS

Notched Projectile Points. The ideal type (Fig. 2 *a–c*) appears to be triangular with slightly convex blade edges. Deep, narrow notches converge distally from the corners. The straight to slightly convex bases have moderate to considerable grinding. Typically, breadth is greater across the barbs than across the base. Cross sections are lenticular with the exception of two plano-convex specimens. Blade edges demonstrate little secondary flaking. Flake scars tend to converge toward the base at less than a right angle to the blade edges.

From this ideal type there is considerable variation. Blade edges may be straight or slightly concave, and these are usually associated with

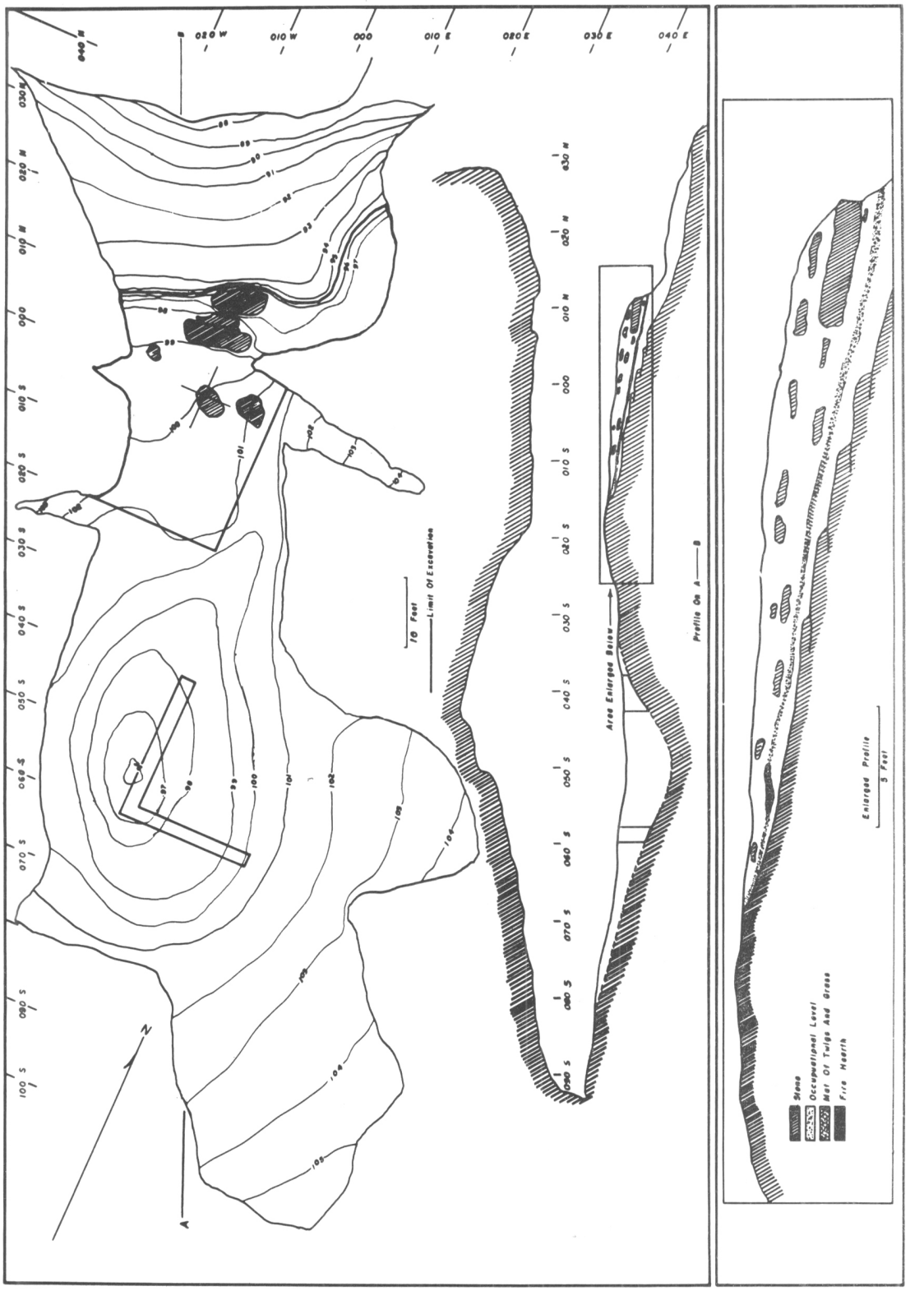

Fig. 1. Topographic map and profile of Spring Creek Cave.

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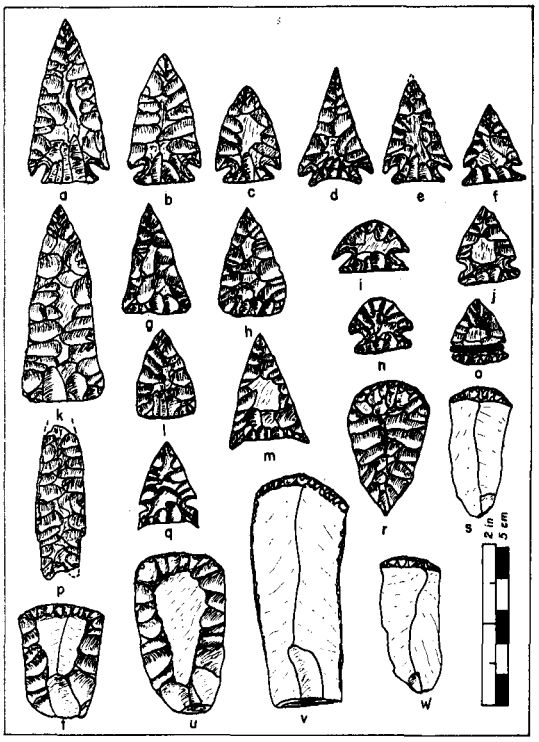

FIG. 2. Projectile points (*a–q*) and scrapers (*r–w*) from Spring Creek Cave.

slightly concave bases (Fig. 2 *d*, *e*). Notches may be wider and shallower and may be initiated from the proximal ends of the blade edges rather than the corners, producing points wider across the base than across the barbs (Fig. 2 *f*, *j*, *o*). Out of context, some of these would be described as side-notched points, but intergrades demonstrate relationships to the ideal corner-notched type. They differ sharply in many characteristics from the typical side-notched points of the Late Prehistoric period. Variations frequently appear to result from incomplete technical dominance and the use of recalcitrant material.

Two points appear to have been broken transversely distal to the barbs and subsequently pressure-flaked bifacially to form rounded distal ends. These were probably repointed on the haft (Fig. 2 *i*, *n*). On two others a light sinew wrapping remains across the notches (Fig. 2 *o*).

A single side-notched point (Fig. 2 *q*) is outside the above range of variation and is reminiscent of those typical of the Late Prehistoric period. Notches form sharp corners with the blade edges, and lateral edges between notches and base are straight and continuous with the blade edges. The base is concave and unground. Flake scars are irregular, and the cross section is plano-convex.

One long slender point (Fig 2 *p*) has a constricted stem and concave base. Flaking is regular and cross section smoothly lenticular. The stem is unground.

Unnotched Projectile Points. This group (Fig. 2 *g*, *h*, *k*, *l*) includes some apparently unfinished items, but most appear to be complete. The apparent ideal type differs from the previously described corner-notched points only in lacking notches. Again, basal grinding is moderate to considerable. Two points are stained with a red pigment, probably hematite.

One unnotched point (Fig. 2 *m*) has prominent barbed corners and appears to have resulted from reworking the base of a notched projectile point that was broken across the notches.

Scrapers. Plano-convex end scrapers are the most numerous artifacts. The apparent ideal type (Fig. 2 *t*, *u*) is a thick percussion flake with a proximal bulb of percussion and a face slightly

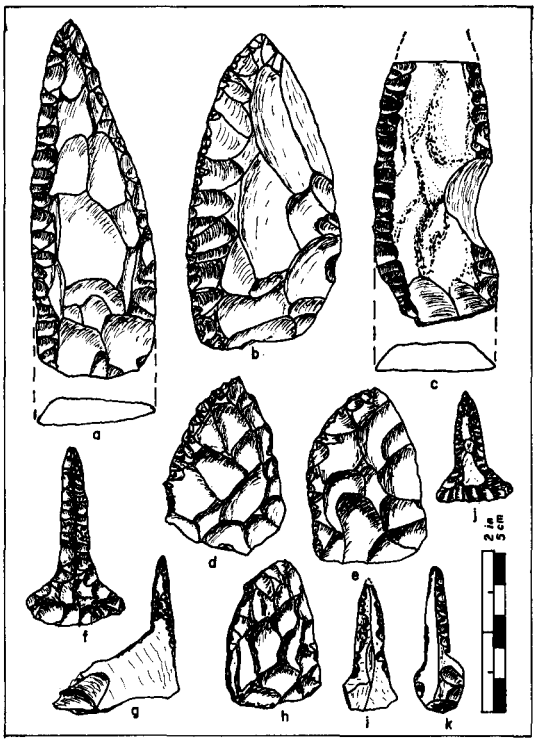

FIG. 3. Knives (*a–e*, *h*) and drills (*f*, *g*, *i–k*) from Spring Creek Cave.

concave distally. The back usually has a median ridge or other irregularities formed by a deliberate or fortuitous pattern of flake scars. The distal end of the back is pressure flaked to a steep bevel forming a convex working edge at right angles to the longitudinal axis. Outlines are variable. Some specimens (Fig. 2 *r*) have backs covered with neat pressure-flake scars. Other variations include specimens with modification of the percussion flake only at the working edge (Fig. 2 *s*, *w*). Occasionally the bulb of percussion is reduced by removal of pressure flakes. Side edges of many specimens are pressure-retouched and dulled by grinding, presumably to prevent cutting of the haft binding. Some specimens (Fig. 2 *v*) are longer and appear unreduced by continued resharpening. They would be effective in their present form without hafting.

Knives. These may be divided into three classes. Class 1 is a large, bifacially percussion-flaked blade (Fig. 3 *a*, *b*) with a secondary pressure retouch. Its outline is asymmetrically pyriform with a straight to slightly convex base. The working edge is formed by steep pressure flakes suggesting continued resharpening that resulted in a progressively more asymmetrical outline.

Class 2 knives (Fig. 3 *d*, *e*, *h*) are rough, bifacially percussion-flaked, ovoid implements that are smaller than Class 1 knives. They may be blanks, but a light secondary pressure retouch usually occurs on one lateral edge. One lateral edge is more convex than the other, and cross sections are roughly lenticular. The retouching produces a rough but efficient cutting edge.

Class 3 knives (Fig. 3 *c*) are reminiscent of Class 1 knives, but they are more varied in outline. One face remains nearly flat, and the opposite face is steeply pressure-flaked peripherally. Occasional projecting flake scars on both faces are reduced by abrasion to produce fairly flat surfaces. All are made of a distinctive dark quartzite.

Stone Drills. These have narrow, bifacially pressure-flaked blades and expanded bases (Fig. 3 *f*, *g*, *j*, *k*). They are made of carefully selected prismatic flakes, and the median ridge of many specimens is unmodified for most of the length of the blade. The cross section is lozenge-shaped. Bases vary in outline, and some are unmodified portions of the original flakes. One exception has a curved, unifacially flaked blade that is plano-convex in cross section (Fig. 3 *i*).

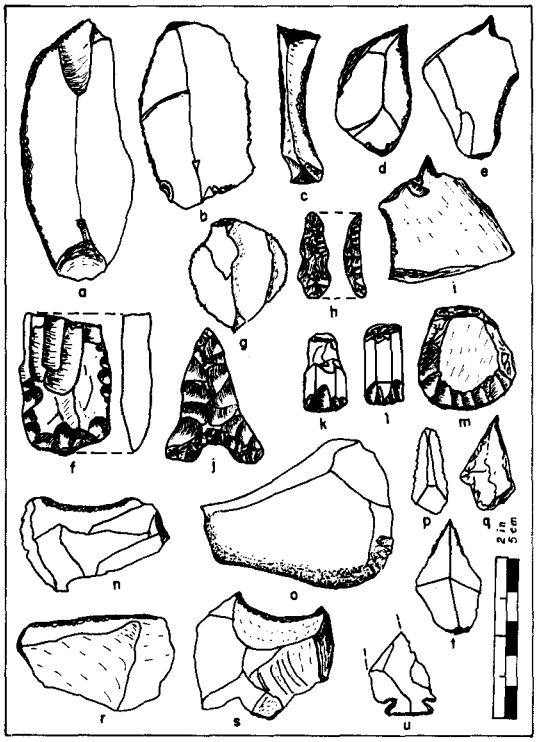

FIG. 4. Retouched flakes (*a–c*, *g*, *h*, *n–p*, *r*, *s*, *u*), gravers (*d*, *e*, *h*, *i*, *q*, *t*), wedge (*f*), chisels (*k*, *m*), and spokeshave (*j*) from Spring Creek Cave.

Gravers. Class 1 gravers (Fig. 4 *d*) are percussion flakes similar to those used in scraper manufacture. The only modification is the graver point, which is formed by a unilateral pressure retouching at a fortuitious intersection of two straight edges. Class 2 gravers (Fig. 4 *e*) are thinner flakes similar to the above but are modified only at the slightly curved and unifacially pressure-flaked point. The flake face is unmodified, and one specimen has a unilaterally pressure-flaked, concave, spokeshave edge adjacent to the graver point. Class 3 gravers (Fig. 4 *i*) are fortuitous flakes with projections modified to short, sharp, bifacially flaked graver points. The specimen illustrated has a unilaterally pressure-flaked spokeshave edge adjacent to the graver point.

Retouched Flakes. Class 1 (Fig. 4 *n*, *r*) consists of flakes of various shapes with one slightly concave to slightly convex edge that is pressure-retouched on the back to form a sharp cutting

TABLE 1. CHIPPED STONE ARTIFACTS FROM SPRING CREEK CAVE, WYOMING

	Dimensions (in cm.)				Type of Stone							Total	Figure
	Max. Length	Min. Length	Max. Width	Min. Width	Jasper	Flint	Chert	Quartzite	Chalcedony	Altered shale	Obsidian		
Projectile Points													
Notched	5.2	1.8	2.5	1.7	12	17	11	5	8	5	–	58	2 *a–f, i, o*
Unnotched	4.5	2.4	2.7	1.7	9	8	7	–	–	–	–	24	2 *g, h, k, l*
Reworked notched	1.7	1.7	2.3	2.0	–	1	1	–	–	–	–	2	2 *i, n*
Reworked unnotched	3.5	–	2.4	–	–	1	–	–	–	–	–	1	2 *m*
Notched variant	2.5	–	1.7	–	–	1	–	–	–	–	–	1	2 *q*
Stemmed variant	5.0	–	1.7	–	–	–	–	–	–	1	–	1	2 *p*
Scrapers	5.5	2.5	3.2	2.0	51	1	15	–	12	–	–	79	2 *r–u, w*
Elongate Scrapers	8.7	7.3	3.0	2.5	3	–	1	–	–	–	–	4	2 *v*
Knives													
Class 1	11.4	9.5	4.5	3.5	2	6	3	1	1	1	–	14	3 *a, b*
Class 2	7.2	3.3	4.5	3.5	3	1	3	1	–	–	–	8	3 *d, e, h*
Class 3	10.5	9.6	4.5	2.9	–	–	–	3	–	–	–	3	3 *c*
Drills	5.7	4.0	3.0	1.4	2	2	3	–	1	–	–	8	3 *f, g, i-k*
Gravers													
Class 1	5.0	4.0	3.2	2.6	3	–	–	–	–	–	–	3	4 *d*
Class 2	4.3	4.1	3.2	3.0	2	1	–	–	–	–	–	3	4 *e*
Class 3	4.9	3.7	4.1	1.9	3	–	–	–	–	–	–	3	4 *i*
Retouched flakes													
Class 1	7.0	3.9	4.1	1.0	14	4	4	–	–	–	2	24	4 *n, r*
Class 2	6.5	2.9	4.6	2.5	3	4	–	–	1	–	3	11	4 *b, g*
Class 3	8.1	6.5	4.2	3.5	2	–	–	1	1	–	–	4	4 *a*
Class 4	6.3	4.1	4.8	2.1	–	1	–	1	1	–	–	3	4 *c, s*
Class 5	4.2	4.3	2.5	2.0	1	3	1	–	–	–	–	5	4 *o*
Choppers	9.7	9.5	9.3	8.4	–	1	1	–	–	–	–	2	8 *n, o*
Wedge	4.7	–	2.9	–	–	1	–	–	–	–	–	1	4 *f*
Notched flake	2.1	–	1.7	–	–	1	–	–	–	–	–	1	4 *u*

edge. Class 2 (Fig. 4 *b, g*) includes thin percussion flakes that are roughly ovoid in outline and have sharp edges. Some edges appear to have been deliberately serrated. Other edges are unilaterally pressure-reduced to varying degrees, probably the result of continued resharpening. Class 3 (Fig. 4 *a*) consists of long, thin percussion flakes with nearly flat faces which have a light unilateral pressure-retouching on one edge that produces an extremely sharp cutting edge. Class 4 (Fig. 4 *c, s*) is made up of thick, fortuitous percussion flakes of varied shape with concave spokeshave edges. Class 5 (Fig. 4 *o*) includes several nondescript flakes with a rounded edge, apparently the result of continued contact with an abrasive surface.

Stone Wedge. One thick, rectangular, percussion flake (Fig. 4 *f*) has a smooth convex face and a rough convex back. A transverse wedge-like edge at one end is opposed by a broad platform at the other. The edge is dulled from use, and several flakes have been driven from the poll by sharp blows.

Cores. One polyhedral, fluted chert core has had flakes driven from its periphery. A subrectangular chert core has had flakes driven from two opposed sides. One irregular jasper core has had flakes driven from three striking platforms.

Choppers. Two biface core choppers (Fig. 8 *n, o*) have subrectangular outlines with irregular edges and rough flake scars. One or more percussion-retouched edges of each would serve for chopping.

Quartz Crystal. Several quartz crystals (Fig. 4 *k, l*) were used as chisels. The distal ends are percussion-flaked to transverse chisel edges. The sides are the unmodified hexagonal crystal. The poll is formed of the softer proximal part of the crystal and is usually battered from pounding. Larger crystals were percussion-flaked to produce flakes. Flakes were driven by using both sides and transverse breaks as striking platforms. The presence of many irregular and internally fractured flakes suggests poor control of this material. Several thin, quartz-crystal flakes are

pressure-retouched on one or more edges (Fig. 4 *p*), and others appear to have been used as gravers (Fig. 4 *q*, *t*). Four unmodified quartz-crystal flakes are covered with a dark red pigment. One piece of quartz crystal has a bifacially flaked, rounded, wedgelike edge and a broad poll at the opposite end (Fig. 4 *m*).

Unclassified Chipped Stone. One narrow, leaf-shaped, unifacially pressure-flaked object (Fig. 4 *h*) has one side covered with small flake scars while the other is the unaltered smooth flake face. It has a suggestion of side notches and is thick in relation to width. If hafted, it would serve as a graver. One triangular, bifacially pressure-flaked object (Fig. 4 *j*) with a lenticular cross section has a deep basal concavity. It suggests an unnotched projectile point but is probably a spokeshave or some other specialized implement. One flake (Fig. 4 *u*) has a poorly formed pair of notches at one end and the other end is broken.

Materials used in the chipped-stone artifacts are available locally with the exception of obsidian. Table 1 gives further information on the flaked materials.

Ground Stone Artifacts

Several irregular limestone cobbles (Fig. 8 *l*, *m*) have one polished convex surface. This polished surface reveals fine, closely spaced striations parallel to the long axis of the stone. The polish decreases from the crown of the convexity in both directions. These do not appear to be manos.

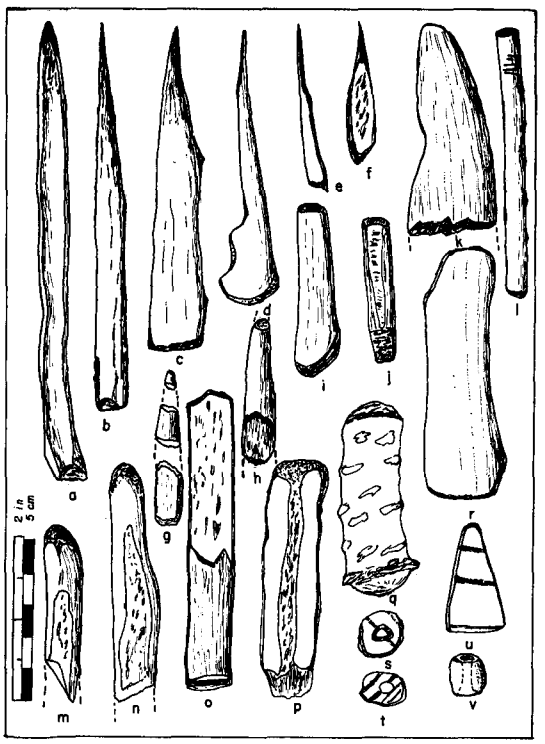

Fig. 5. Bone (*a–h*, *k–p*, *r*) and antler (*i*, *j*, *q*) implements, shell ornaments (*s–u*), and ground stone bead (*v*) from Spring Creek Cave.

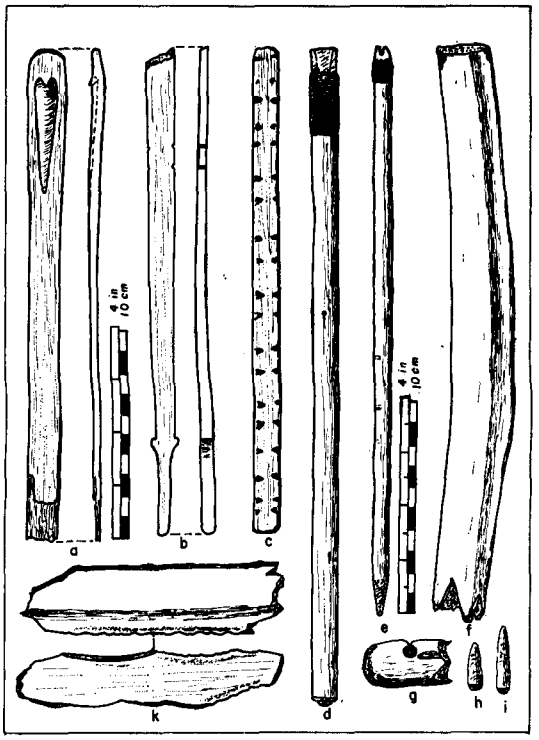

Fig. 6. Atlatl fragments (*a*, *b*), gaming stick (*c*), shaft fragment (*d*), foreshaft (*e*), beaming tool (*f*), fire hearth (*g*), fire drills (*h*, *i*), and graining tools (*j*, *k*) from Spring Creek Cave.

Two hammerstones are elongated, granite river cobbles, each with a battered end.

One small amber calcite bead (Fig. 5 *v*) is biconically drilled. Two elongated pieces of similar amber calcite suggest atlatl weights. One broken specimen (Fig. 9 *k*) is ground and polished and has one flat and one convex side. The other (Fig. 9 *l*) is smaller and half-hexagonal in cross section.

One fossil belemnite (Fig. 9 *m*) has a polished pointed end, and another similar specimen is coated with red pigment. A point of a belemnite (Fig. 9 *n*) has been severed transversely by sawing to the center from opposite sides. The point had previously been ground to a chisel point. Another central section of belemnite (Fig. 9 *o*) was formed by two transverse breaks, and the rough edges were reduced by grinding.

Several lumps of red hematite were presumably ground for red pigment.

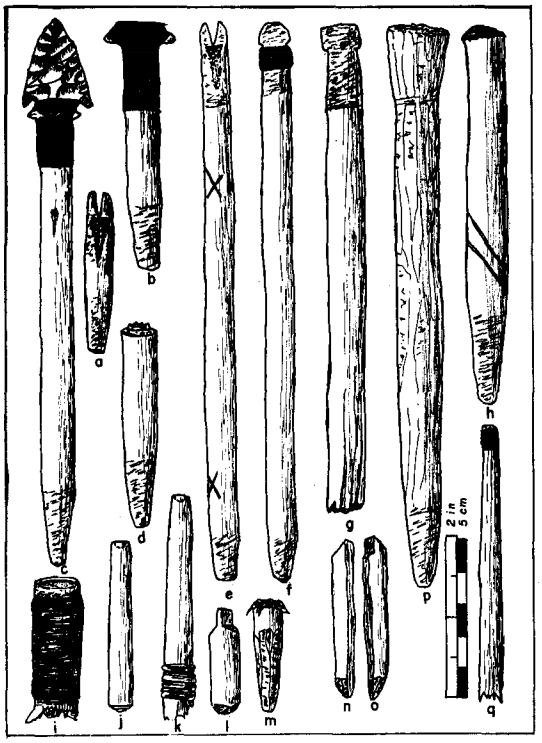

FIG. 7. Foreshafts (*a–h*, *p*), shaft fragments (*i–k*, *m*, *q*), rabbeted twigs (*n*, *o*), and tenoned discard (*l*) from Spring Creek Cave.

WORKED BONE AND ANTLER

Awls. Class 1 awls (Fig. 5 *a–c*) are large, rough, and irregular slivers of unidentified long bone with one end ground to a long slender point. Rough proximal edges of one specimen have been reduced by grinding. Class 2 awls (Fig. 5 *e*, *f*) are smaller and are made of thinner bone than Class 1 awls and have slender, extremely sharp points. In Class 3 awls (Fig. 5 *d*), unidentified ulnae have points formed by oblique grinding through the thinnest part of the diaphysis. The unmodified proximal end serves as a handle. Class 4 (Fig. 5 *g*, *h*) consists of fragments of two awls made from split sections of elk antler. The one proximal fragment demonstrates grinding to remove rough surfaces.

Beaming Tools. These are the most frequently recovered bone artifacts. They are made of bison ribs with both ends broken transversely (Fig. 6 *f*). The rough edges of some specimens have been reduced by grinding. Most posteriomedial surfaces are polished as if by rubbing.

Graining Tools. These include both lateral and medial sections of split bison ribs (Fig. 6 *j*, *k*). The edges have shallow polished notches of varying widths. One unsplit rib section has the notches in its thin posterior edge. A considerable amount of unidentified residue adheres near the edge of the polished areas, suggesting use on hides. Ribs were split by destroying posterior and anterior edges by pounding and then splitting through the cancellous bone.

Knapping Tools. Pieces of long bone have one end rounded and the opposite end broken. Marks on the complete end suggest that these are broken knapping tools (Fig. 5 *m*, *n*).

Hide Abrader. The proximal epiphysis of a bison humerus (Fig. 8 *k*) has had the compact bone of the adjacent diaphysis removed to expose a projecting abrasive surface of cancellous bone. The articular surface serves as a palm-fitting handle. The rough edges are ground smooth, and the cancellous surface is flattened from use.

Bone Scrapers. Several elongated fragments of heavy long bone (Fig. 5 *r*) have scraping edges formed at one end by either deliberate or

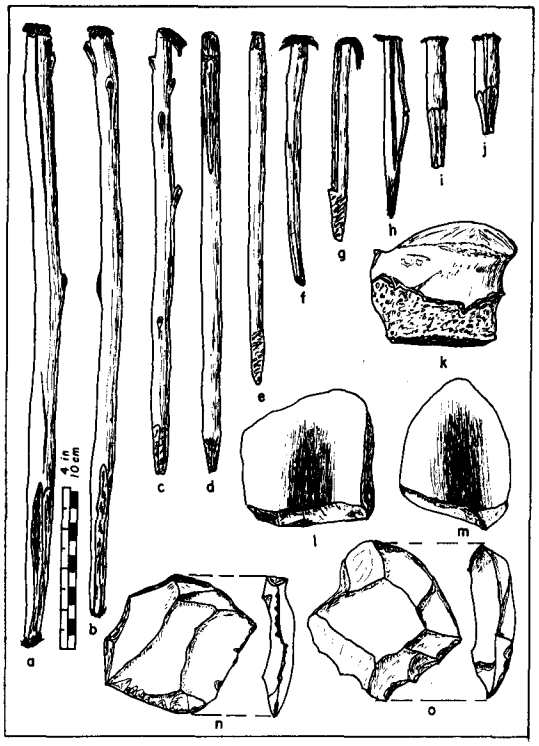

FIG. 8. Wooden stakes and pegs (*a–j*), bone abrader (*k*), rubbing stones (*l*, *m*), and choppers (*n*, *o*) from Spring Creek Cave.

fortuitous breaking. These edges reveal differing amounts of wear from scraping.

Miscellaneous Bone. One artifact (Fig. 5 *p*) is made from the scapula of an unidentified animal. The spinous process was removed by grooving, breaking, and grinding, and similar treatment on each side of the spinous process produced an elongated, parallel-sided tool. One end is ground to a transverse unilateral bevel reminiscent of a plano-convex end scraper. A shallow pair of obliquely placed notches suggest that it may be some sort of a tool haft.

A section of rib, probably antelope, is cut transversely at one end and broken at the other (Fig. 5 *o*). Anterior and posterior edges are ground through to the cancellous bone. All but the broken areas are covered with red pigment.

One vaguely triangular section of the lateral part of a large split rib is broken transversely (Fig. 5 *k*). The outside surface and the edges are polished, and the cancellous face is unmodified. It appears to be part of a larger problematical artifact.

One bird bone (Fig. 5 *l*) has been cut at both ends by encircling grooves, and the entire surface is polished. It has five closely spaced notches near one end and two others near the center.

Antler Wedges. These (Fig. 5 *i, j*) are strips of elk antler removed by incising two parallel grooves through the compact antler surface to the cancellous interior and then lifting out the strip. One end is ground to a double-beveled chisel edge, and the other end is rounded. Sides are ground to form rectangular cross sections. One deer antler (Fig. 5 *q*) is cut transversely near the base and both ends are ground smooth. One otherwise unaltered elk incisor tooth has a coating of red pigment.

Worked *Unio* Shell

Three discoidal beads have central conical holes drilled from the inside of the shell. Circumferences are ground smooth (Fig. 5 *s, t*). Two similar disks have ground edges but are without holes, and one of these is coated with red pigment. Three triangular pieces of shell have edges ground smooth (Fig. 5 *u*). Several pieces of shell suggest similar unfinished objects roughly shaped by breaking. At present *Unio* is common in local sluggish streams.

Worked Wooden Material

Atlatl Fragments. One distal (spur-bearing end) and four proximal (handle ends) were recovered. The distal fragment (Fig. 6 *a*) is 23.3 cm. long, and the maximum width is 1.7 cm. Thickness varies from .4 to .8 cm. The spur-bearing side is slightly concave and the opposite, convex. The spur is .4 cm. long and is centrally located 1.5 cm. from the distal end, being produced in relief by removing the wood around it. A groove .9 cm. in maximum width tapers from it and finally disappears 5.5 cm. toward the distal end. The entire fragment is smoothed and polished except the groove, which is only smoothed. All surfaces are stained with a red pigment.

The four proximal fragments are similar to the distal fragment in color, finish, and general appearance. The most complete (Fig. 6 *b*) is probably part of the distal fragment. It is 23.5 cm. long and expands distally in width from .6 cm. to 1.3 cm. Thickness varies from .4 cm. to .6 cm. The spur-bearing side is slightly concave distally, matching the distal fragment. The opposing side is slightly convex distally and gradually flattens proximally. Size, shape, color, and material correspond closely to the distal fragment. Two opposed pairs of edge notches are respectively 11.5 cm. and 12.2 cm. from the proximal end. An opposed pair of lateral lugs are centered 4.8 cm. from the proximal end. These are .4 cm. long at the base and extend .2 cm. laterally to the shaft edge. On the side opposite the spur in the vicinity of the notches, a patch (about 3 cm. long) of what appears to be pitch covers most of the surface. The other three proximal fragments are similar to corresponding sections of the larger piece.

Dart Shafts. Nine distal shaft ends vary in diameter from 1.2 cm. to 1.6 cm. Conical sockets, distally placed, vary in orifice diameter from .8 to .9 cm. and taper to depths of 2.5 to 2.8 cm. Spiral or transverse scoring, probably to help secure sinew binding, covers 1.4 to 2.3 cm. of the distal ends of four specimens. One is unscored and the others are too badly eroded for determination. Two have sinew wrappings about the socket. On one (Fig. 6 *d*) the wrapping begins 1.8 cm. from the end and extends proximally 3.5 cm. Spiral scoring is visible at both ends of the wrapping. This fragment is 34.9 cm. long. The other (Fig. 7 *i*) has a wrapping 3.3 cm. long beginning .5 cm. from the distal end. This shaft is broken proximally to the wrapping. Light transverse scoring is visible beyond the wrapping and the shaft has a heavy coating of red pigment.

Two unpainted fragments have spirally scored distal ends and highly polished surfaces.

Sixteen specimens appear to be proximal ends of shafts and have shallow, cuplike depressions in one end, presumably to engage the spur of the atlatl. Of these, 13 are cut distally, subsequent to use as shafts (Fig. 7 *j*), and three are broken distally (Fig. 7 *k, q*). Diameters of the proximal ends vary from .6 cm. to .7 cm. Cup diameters are .3 cm., and cup depths are .2 cm. Three have a light sinew binding .7 cm. wide at the cupped end (Fig. 7 *q*). One has a sinew binding 1.1 cm. wide, beginning 5.3 cm. distal to the cup (Fig. 7 *k*). Three are coated with red pigment. All fit the atlatl groove and easily engage the spur of the atlatl fragment. All taper toward the cup, this form being produced by long lengthwise cuts partially smoothed by grinding longitudinally against an abrasive surface. Cut ends suggest careful mending of the broken shafts.

Nocked and Tapered Foreshafts. Thirteen nocked and tapered foreshafts vary in length from 5.1 cm. to 27.3 cm. Diameters vary from .8 cm. to 1.1 cm. All nocks are about .7 cm. in depth and were formed by making a pair of opposing V-shaped cuts at the point selected for the distal end of the foreshaft and lacking the width of the nock of meeting in the center. Two opposing shallow cuts were then made proximal to and at right angles to the first at a distance equal to the depth of the nock. By careful manipulation, the excess wood was broken out between the two sets of cuts, producing a nearly complete nock and a piece of shaft with a tenon on the end which was discarded. Six such tenons on the ends were recovered (Fig. 7 *l*).

Further foreshaft preparation consisted of widening the proximal cuts mentioned above to form prominent shoulders at right angles to the nock for anchoring the projectile point. Irregularities were reduced by grinding, and spiral to transverse scoring is usually present on the surface from 1.6 to 2.1 cm. proximal to the base of the nock (Fig. 6 *e* and Fig. 7 *a, e, f*). Two specimens have a light sinew binding, presumably to prevent splitting (Fig. 6 *e* and Fig. 7 *f*). Socketing proximal ends taper inward 5 to 6° from the shaft circumference with close tolerance. The tapered area is spirally scored, presumably to aid in tightening the joint. No evidence of adhesive appears on sockets or socketing ends. The remaining foreshaft surface finish varies from bark removal only to careful reduction to cylindrical form that bears fine lengthwise striations produced by grinding. Most have a coating of red pigment.

Two hafted projectile points (Fig. 7 *b, c*) are bound by a crisscross sinew wrapping from the projectile-point notch to the opposite foreshaft shoulder. Transverse bindings continue 1.4 and 1.1 cm. proximally to the projectile-point base. No evidence of adhesive accompanies the binding, and sinew ends cannot be detected. In one specimen, binding and foreshaft have a heavy coating of red pigment.

One foreshaft (Fig. 7 *e*) has an incised X 3.5 cm. from the distal end and a second similar mark 2.8 cm. from the proximal end. Another has a similar incised X .3 cm. from the distal end.

Nine similar fragments with tapered and spirally rasped proximal ends range from 4.6 to 12 cm. in length and 1 to 1.3 cm. in diameter. Distal ends are battered; other surfaces are well-finished, and seven have a coating of red pigment. One has two short, diagonal, parallel lines etched near the distal end (Fig. 7 *h*). These are problematical and may be bunt or practice points.

A similar group (Fig. 7 *d*) of 12 specimens ranges from 4.2 to 9.1 cm. in length and .9 to 1.2 cm. in diameter. Distal ends were cut off, apparently subsequent to their use as foreshafts. These may be unused specimens of the above group.

Six distal and eight proximal fragments have broken and splintered ends and are probably manufactured debris. At least two of the distal fragments have carefully formed nocks and may be hafts for implements other than projectile points (Fig. 7 *g*).

One specimen (Fig. 7 *p*) may be a bunt shaft. The proximal end is tapered and spirally rasped. The shaft maintains a diameter of 1.5 cm. to within 3 cm. of the distal end, at which point the diameter progressively increases to 2 cm. at the end. The distal end is transversely flattened and battered.

Gaming Stick. One split twig (Fig. 6 *c*), 23.3 cm. long and 1.2 cm. wide, has smoothed and polished sides, edges, and ends. Its flat surface is marked with 19 opposed pairs of small, subtriangular burned areas with points oriented toward the central axis of the stick.

Fire Drills. Two fire drills (Fig. 6 *h, i*) are 3.1 and 4.2 cm. in length and 1 cm. in diameter. One end of each is tapered for socketing, and

the other is charred and rounded as if from spinning in a hearth. These are presumably heads of compound fire drills. One fragment of a hearth (Fig. 6 *g*) was found.

Stakes and Pegs. A variety of items appears to have been used primarily or secondarily as stakes and pegs. Two distinctive specimens (Fig. 8 *a, b*) are, respectively, 36.5 and 39 cm. long and 1.4 and 1.6 cm. in diameter. They are peeled branches with carelessly reduced rough knots. Distal ends were sharpened by chopping on three-fourths of the diameter, leaving the remaining side unreduced to the point. Final pointing was accomplished by abrading on a rough surface. Proximal ends have been rounded and battered as if by pounding.

Eight pieces of shafts (8.4 to 27.6 cm. in length) have tapered proximal ends and the opposite ends shredded and battered from pounding (Fig. 8 *c–e*, g). Six pieces of painted shaft (3.6 to 8.1 cm. long) have one pointed and one battered end (Fig. 8 *f*, *h–j*). One specimen (Fig. 7 *m*) has fragments of sandstone embedded in the proximal end as if a large piece of sandstone had been used as a hammer. One unmodified sliver of a large branch 13.9 cm. in length (Fig. 9 *g*) had been driven into the occupation surface.

Paint Applicators. One twig (Fig. 9 *h*) has a shredded end impregnated with red pigment. One peeled and tapered twig (Fig. 9 *i*) has black pigment adhering to the tapered end, and two others have similar coatings of red pigment.

Wooden Awls. Two split twigs (Fig. 9 *r*) have one end ground to a sharp point. These appear to be punches or awls.

Problematical Worked Wood. A number of wooden items are of obscure purpose. Some are probably debris of manufacture, and others may be articles with a definite purpose. They provide considerable insight into woodworking methods.

Cut and Tapered Wooden Objects. These 20 elongate objects of circular cross section vary from 4.9 to 10.5 cm. in length and 1.3 to 1.9 cm. in diameter. One end is tapered for a distance that varies from 3.2 to 7 cm., and this surface bears longitudinal knife scars, some smooth and others rough, as if produced by a sawing motion rather than a straight cutting motion. Modification results in tapered points that vary from sharp to rounded and in rather blunt

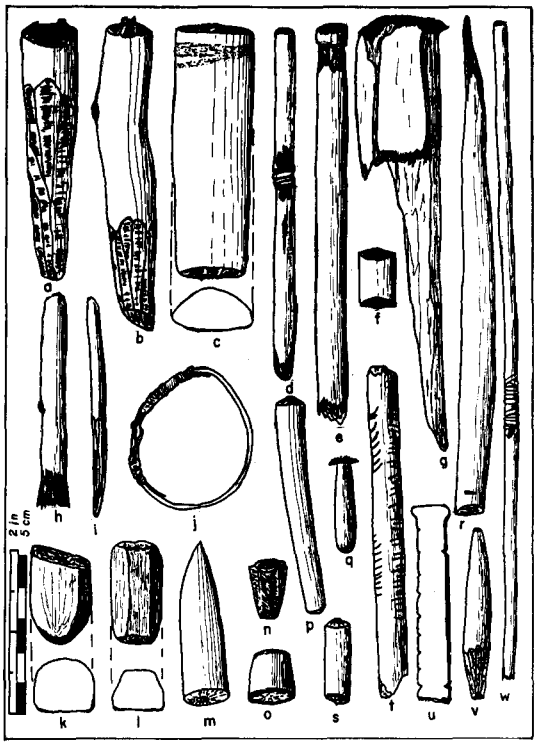

FIG. 9. Miscellaneous worked wood and ground stone from Spring Creek Cave: cut and tapered wooden objects (*a, b, q, v*), wooden hafts (*c, e, u*), sinew-wrapped twigs (*d, w*), wooden cylinders (*f, p, s*), stake (*g*), wooden paint applicators (*h, i*), worked calcite (*k, l*), worked belemnite (*m–o*), wooden awl (*r*), incised twig (*t*), and bark-wrapped twig (*j*).

points formed by steep diagonal cuts. Sixteen have opposite ends cut off by an encircling series of cuts that reach nearly to the center of the shaft (Fig. 9 *b*). Four have opposed V-shaped cuts meeting at the center of the shaft (Fig. 9 *a*). These are puzzling items. The tapered ends of some specimens appear slightly battered as if by pounding, but in no case is the square-cut end so treated.

Sinew-wrapped Twigs. Ten fragmentary peeled and smoothed twigs, .4 to .6 cm. in diameter, have one end cut and the other broken (Fig. 9 *d, w*). Six are coated with red pigment. All have light sinew wrappings, and in three specimens the wrapping covers feather fragments. These do not appear to be arrow or other projectile shafts.

Wooden Cylinders. Several lengths of square-cut, peeled, and polished shafts (Fig. 9 *p, s*) vary in length from 2.7 to 6.9 cm. and in

diameter from .7 to 1.4 cm. The entire surface of one split wooden cylinder is stained red (Fig. 9 *f*).

Incised Twig. A peeled twig (Fig. 9 *t*) has a series of 39 transverse knife cuts on one side and a series of eight and another of 11 on the opposite side. It may be some sort of counter or tally stick.

Split and Rabbeted Twigs. These were made by preparing various lengths of peeled twigs .5 to .6 cm. in diameter. The twig is split lengthwise, and both sections are brought to a wedge-shaped point at one end. One of each pair of split sections is transversely rabbeted about .1 cm. in depth and varying from .3 to .6 cm. in length on the split side of the wedge-cut end. There are 16 such notched specimens (Fig. 7 *n, o*), and four of these pair with their corresponding unrabbeted sections. When pairs are fitted together, the rabbet produces a flat-bottomed, transverse notch. In the four matched pairs, only one of each pair is rabbeted. In at least one case, stains suggest that the pair was bound together.

Possible Dog-travois Fragments. Three poles are tied together with a series of sinew wrappings (Fig. 10 *a*). One pole is continuous for the length of the bundle, and the other two overlap for a short distance so that both ends of the bundle terminate in two poles. One end of the bundle is broken, and the other appears to be finished and complete. The two overlapping poles are worn to smooth, obliquely tapering points, and this wear was antecedent to the assembly of the bundle. Two similar poles (Fig. 10 *b*) are tied with sinew, and their size and general appearance suggest that they may be the opposite end of the first bundle. Another similar item (Fig. 10 *d*) is a peeled and smoothed pole, broken at one end and bearing an oblique-tapering point at the other. The general appearance of all the above items suggests that they may be part of a single device, perhaps parts of a dog travois. The angle and character of the wear on the single pole is such as would be produced on the distal end of a dragging travois pole. One of the overlapping poles in the first bundle is worn in a manner similar to the long single pole. The tied poles could be re-used worn and broken poles that were spliced to produce a desired length. All these items were found stacked together, suggesting a relationship to each other. Several other pole fragments (Fig. 10 *c*) with obliquely worn ends were also recovered.

Hafts. Two split sections of branches are 8 and 9.4 cm. long and 2.5 and 2.6 cm. in width. The rough edges are smoothed, and ends are cut squarely. One has stains on one end that suggest a wrapping and possible use as a haft (Fig. 9 *c*).

One problematical object (Fig. 9 *u*) is 6.3 cm. long and has one flat and one slightly convex side. It is well-finished and stained red. The width at the broken end is .9 cm., at which point a slight taper extends to .5 cm. from the unbroken end, where a pair of projections extend .2 cm. from the sides. Along one edge is a series of nine shallow notches, and the opposing edge has two shallow notches.

One highly polished shaft fragment 3.1 cm. long and 0.5 cm. in diameter is rounded at one end and shredded and flattened by pounding at the other (Fig. 9 *q*). Another polished shaft fragment (Fig. 9 *e*) has one rounded end and an encircling groove .5 cm. from the end. The opposite end is broken.

One piece of mountain mahogany (*Cerocarpus ledifolius*) has both ends tapered. One taper is polished, the other rough (Fig. 9 *v*). A strip of wood .5 cm. wide and .2 cm. thick has its ends tied together with a strip of willow bark to form a circle 4 cm. in diameter (Fig. 9 *j*). One branch, 53 cm. long and 1.7 cm. in diameter, is broken at one end and burned at the other. Small charcoal fragments have been forced into the burned end as if it had been used to stir a fire.

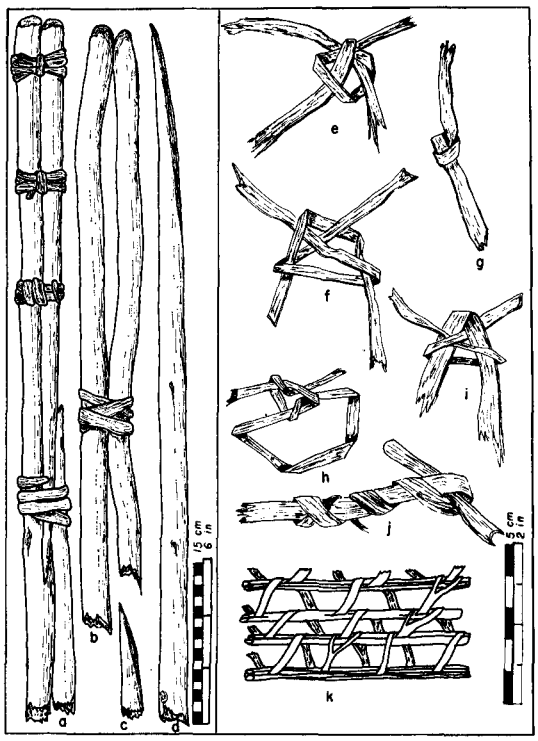

FIG. 10. Miscellaneous materials from Spring Creek Cave: possible dog-travois fragments (*a–d*), knotted bark (*e–j*), and detail of coiled basketry technique (*k*).

MISCELLANEOUS MATERIAL

Feathers. Several vanes (Fig. 11 *d*) were stripped from the rachis, and the distal ends of these vanes were carefully trimmed parallel to the rachis to a width of 2.3 to 2.7 cm. These appear to be dart-fletching debris. One vane section (Fig. 11 *e*) has the pithy part of the rachis attached, and this pith bears a series of incised notches. Several wing feathers (Fig. 11 *a, c*) have the quill cut off squarely at the beginning of the downy portion. The downy portion was removed and the surface of the rachis spirally scored for a short distance. The scored surface of one specimen is covered with a sinew wrapping, and the anterior vane bears a series of notches. These have no demonstrable relationship to dart-shaft fletching.

Encircling a short twig (Fig. 11 *b*) is a flattened strip of quill. Each end of the strip is folded under itself and held in place by a fine strip of sinew passed under the folds and tied with a square knot. Several flattened strips of quill are stained with a red pigment. Of several flicker tail feathers, at least two have trimmed vanes.

Basketry. One center of a coiled basket (Fig. 10 *k*) is of single rod foundation that is split many times by the sewing so that it appears almost as a bundle of splints. There are three foundation rows to 1 cm. and four stitches to 1 cm. Each stitch splits the rod of the previous coil. Some stitches interlock and some are split. Both rods and sewing elements appear to be willow. A quantity of peeled and split willow twigs appears to be raw material for baskets.

Sinew. Four pieces of two-strand, Z-twist sinew thread (Fig. 11 *n*) taper to a fine point and suggest discarded ends of longer lengths formed by rolling between the hand and another surface. Three pieces of single-strand, twisted-sinew thread .25 mm. in diameter are stained red. Two pieces of split twig (Fig. 11 *k*) have several loose wrappings of untwisted sinew and may have served as spools. There is a quantity of shredded and unshredded sinew.

Bark. A quantity of willow, chokecherry, and juniper bark suggests use as cordage. Knots found on strips of bark include the following: square knot (Fig. 10 *h*), granny knot (Fig. 10 *e*), overhand knot (Fig. 10 *g*), carrick bend (Fig. 10 *f*), and sheet bend (Fig. 10 *i*). Other lengths of bark were used without specific knots (Fig. 10 *j*). The variety suggests a familiarity with these knot characteristics and their adaption to various materials and purposes.

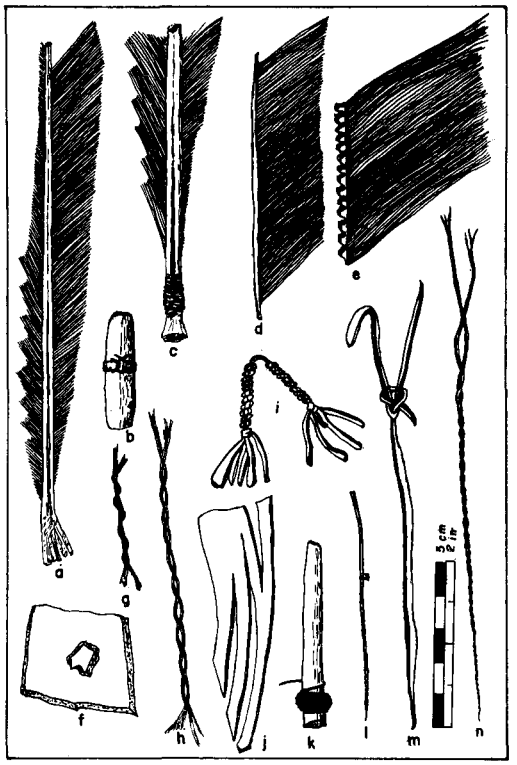

FIG. 11. Miscellaneous materials from Spring Creek Cave: feathers (*a, c–e*), quill-wrapped twig (*b*), tanned hide (*f, j, m*), fiber cordage (*g, h*), porcupine quill techniques (*i, l*), and sinew (*k, n*).

Tanned Hide. Several scraps of tanned hide range from paper-thin rodent hide to heavy bison hide. Several lengths of soft hide are stained red, and two pieces are tied together with a sheet bend knot (Fig. 11 *m*). One subrectangular piece of thick tanned hide has an irregular hole in the center (Fig. 11 *f*). A piece of thin, tanned hide has several cuts and is probably a core remnant of a larger piece from which sections were cut (Fig. 11 *j*). Several scrapings of bison and antelope hide are of a form that may be reproduced with a stone scraper.

Porcupine Quill Work. One small strip of tanned hide was wrapped with flattened porcupine quills (Fig. 11 *l*). Another strip was knotted with a series of closely spaced overhand knots, and fringes of tanned hide were added to the ends (Fig. 11 *i*).

Vegetable Fiber Cordage. One piece of 2-strand, S-twist cordage (Fig. 11 *g*) and three pieces of 2-strand, Z-twist cordage (Fig. 11 *h*) are probably of yucca fiber. Several partly shredded yucca leaves and several lengths of clematis vine were recovered. The latter makes fairly efficient cordage when green and is obtainable in long lengths.

Pitch. A lump of pitch about 2 cm. in diameter was found.

CONCLUSIONS AND SPECULATIONS

The lithic material of Spring Creek Cave demonstrates general similarities to several Late Middle period assemblages from stratified sites in the Northwestern Plains and adjoining areas. These widely scattered sites include Signal Butte II (Strong 1935: 224–39); Pictograph Cave II (Mulloy 1958: 47–51); McKean site, upper level (Mulloy 1954: 441–57); Deadman Cave, lower level II to level IV (Smith 1941: 16–18); Promontory Cave No. 2, 30- to 42-in. depth (Steward 1937: 93–106); Black Rock Cave, trench A, 10- to 36-in. depth (Steward 1937: 114–15); and Danger Cave, levels III to V (Jennings 1957: 115–19).

Two sites in the same general area of Spring Creek also reveal similarities. One is Birdshead Cave on the south slope of the Owl Creek Mountains in the Shoshone Basin of Wyoming. Here a small amount of similar lithic material was recovered from upper level II to lower level IV (Bliss 1950: Fig. 58). The other site is Wedding of the Waters Cave (Frison 1962) at the southern tip of the Big Horn Basin. Here level II is similar to the Spring Creek occupation in its lithic assemblage as well as in the small series of perishable items that was recovered. The latter includes wooden stakes, split and rabbeted twigs, foreshafts with battered ends, mounted foreshafts, tenoned discards from foreshaft manufacture, and a bison-humerus abrader. A radiocarbon date of 1620 ± 200 years B.P. (approximately A.D. 330 ± 200) from level II is close to the Spring Creek date of 1725 ± 200 B.P. (approximately A.D. 225 ± 200). Both carbon samples were obtained from hearths.

Similar perishable materials occur at sites in the Southwest. An atlatl similar to the Spring Creek specimen was found by Kidder and Guernsey (1919: 178–80) at a Basketmaker site in the Kayenta district of northeastern Arizona. Kayenta shafts and foreshafts have a general similarity to those from Spring Creek Cave, but Kidder and Guernsey do not describe the method of forming the nocks in the foreshafts. Cosgrove (1947: 48–58, 144–9) reports similar atlatls and darts and describes the method of foreshaft manufacture with tenoned discards from the Upper Gila and Hueco areas in New Mexico and Texas. Here woodworking techniques are reminiscent of those observed in the Spring Creek material. Harrington (1933: 89–112) notes similar darts and foreshafts in Gypsum Cave, Nevada, again with the same technique of foreshaft manufacture. These materials he regards as Basketmaker. A wooden foreshaft from level III of Danger Cave appears similar to those from Spring Creek (Jennings 1957: 182).

The environs of the Spring Creek Cave site are significant. The cave is in a zone of ecological transition about 1 mi. in width. To the west is an extensive Upper Sonoran zone and to the east is a fairly extensive Canadian zone (Carey 1917). Grass is abundant, but water is scarce and found only in canyon bottoms difficult of access. Such a place is Spring Creek Canyon. Even today livestock moves back and forth to water over trails well established by earlier bison. No evidence indicates that other dependable water sources existed during the period of the Spring Creek occupation. It seems likely that the site vicinity provided the only available water source in a large surrounding area. A group of people living in the cave could hunt successfully by waiting for game in search of water.

With the exception of bison, the flora and fauna in the occupation level are well-represented near the site today. Bison (*Bison bison*) made up most of the faunal material, with decreasing amounts of antelope (*Antilocapra americana*), elk (*Cervus canadensis*), mountain sheep (*Ovis canadensis*), mule deer (*Odocoileus hemionus*), rockchuck (*Marmota flaviventris*), jackrabbit (*Lepus* spp.) and dog or coyote (*Canis* spp.). Birds were golden eagle (*Aquila crysaetos*), great horned owl (*Bubo virginianus*), crow (*Corvus* spp.), and flicker (*Colaptes cafer*).

A number of wild plants and shrubs offer a source of food, but the only ones present in the occupation level were chokecherry (*Prunus virginiana*), cactus (*Opuntia polyacantha*), Oregon grape (*Berberis aquifolium*), and wild onion (*Allium textile*), These occur in small

quantities and probably did not constitute a very important part of the diet.

Atlatl fragments are of a tough shrub locally known as skunkbrush (*Rhus trilobata*). Other identifiable worked wood is chokecherry, willow (*Salix* spp.), lodgepole pine (*Pinus latifolia*), and mountain mahogany (*Cerocarpus ledifolius*). Several specimens of plants and animals in the occupation stratum were taken at a stage of maturity reached in the latter part of the summer, which suggests summer occupation.

Also of interest are the surface artifact assemblages in the general area. From the badlands to the mountains, many surface campsites demonstrate lithic assemblages similar to that at Spring Creek Cave. However, there are marked changes in relative numbers of artifact types. In the badlands, metates and manos associated with circular, stone-filled roasting pits are frequent. As one approaches the mountains, grinding tools decrease steadily and projectile points, knives, and scrapers become more numerous. This may represent a seasonal change in economic exploitation, with badland areas being utilized in winter and sites such as Spring Creek Cave in the summer. Except for a few deep canyons, the area at elevations above the Upper Sonoran zone usually becomes uninhabitable in the late fall or early winter.

The Spring Creek Cave site appears to represent a Late Middle period group of nomads who were oriented toward hunting larger species of game, especially bison and, to a lesser degree, antelope, elk, and mountain sheep during the summer and other fortuitously favorable months. With untenable conditions during the winter months and with probable migration of nearly all game animals to lower elevations, these people probably descended to localities where badland areas were used extensively and economic orientation shifted toward vegetable and small-animal gathering. The present evidence can only suggest this seasonal exploitation. Its definite establishment will depend on more detailed investigation of a variety of sites in the area.

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