BONE PROJECTILE POINTS: AN ADDITION TO THE FOLSOM CULTURAL COMPLEX

George C. Frison and George M. Zeimens

Extinct subspecies of Bison *were taken in mass kills with the aid of natural and artificial traps during Paleoindian times. A succession of chipped stone projectile points diagnostic of different cultural complexes was used. Bone projectile points can now be added to the fluted stone points of Folsom weaponry.*

THE FOLSOM CULTURAL COMPLEX

FOLSOM HAS BEEN OF LONG-STANDING INTEREST to American Archaeology and there are a number of acceptable radiocarbon dates that place it within the 10,200–10,850 B.P. time range (Haynes 1967; Frison 1978: 23). It provided the first satisfactory evidence for the association of man and extinct animals in the New World and, in doing so, opened the way for Early Man or Paleoindian studies. Recognized by a distinctive projectile point with flutes or channels removed on one or both faces, the stone technology expressed in the manufacture of Folsom projectile points has unfortunately tended to overshadow other aspects of the culture.

A number of bison kills are known for the Folsom time period (Wormington 1957) and these have yielded fluted projectile points. The original Folsom site (Figgins 1927) was the scene of a seasonal animal kill judging from the ages of the animals recovered. Animals in age groups one year apart, as determined by tooth eruption and wear, strongly indicate seasonal restrictions of the procurement period to the late fall or early winter (Frison 1978:149). The Lindenmeier site (Roberts 1935, 1936) may have been associated with a bison kill but the skeletal material was not preserved for study. The Linger site in Colorado (Hurst 1943) was a Folsom bison kill; the Lipscomb site (Schultz 1943), the Lake Theo site (Harrison and Killen 1978), the Bonfire Shelter (Dibble and Lorrain 1968), and the Lubbock Lake Site (Sellards 1952; Johnson 1974), all in Texas, contain evidence of bison procurement in Folsom times.

THE AGATE BASIN SITE

The Agate Basin site in eastern Wyoming (Roberts 1961) was the scene of a large bison kill during the time of the Agate Basin cultural complex and has been dated to 10,430 ± 570 B.P. (RL 557). The site was an arroyo kill. The animals were driven up a steep-walled arroyo until a perpendicular, impassable barrier, referred to as a knickpoint (Schumm and Hadley 1957), was reached. The bison, forced to reverse direction in order to escape, would panic and fall easy prey to the hunters. These kinds of landforms are common on the Plains and were regularly used for bison trapping throughout the terminal Pleistocene and Holocene periods. Agate Basin hunters killed their bison with lanceolate-shaped stone projectile points, but whether they were used on the end of a thrusting spear or propelled with a throwing stick or both is conjectural.

Directly below the Agate Basin bone bed is a Folsom Component reported earlier (Agogino and Frankforter 1960) and more fully investigated in 1978. Three Folsom cultural levels can be defined: two of these have been disturbed by water runoff but one is still in situ and contains partial

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Figure 1. Part of the bone bed in a Folsom bison kill at the Agate Basin site in eastern Wyoming.

remains of at least five bison (Figure 1). It is postulated the Folsom bison were killed in the arroyo in a manner similar to that of the Agate Basin bison.

Around the north and east sides of the bison kill area is evidence of extensive campsite activity. It is postulated that the hunting group killed the bison and simply moved into the immediate area and lived for a time off the meat products. The stage of development of bison fetal material suggests it was a winter kill. This area also contains evidence of considerable stone-flaking activity, including the complete sequence of Folsom projectile manufacture. One nearly complete Folsom projectile point (Figure 2a) leaves no doubt of the identity of the cultural component. Also present is a tool assemblage consisting of primary butchering tools in the carcasses and many other tools in the peripheral campsite area.

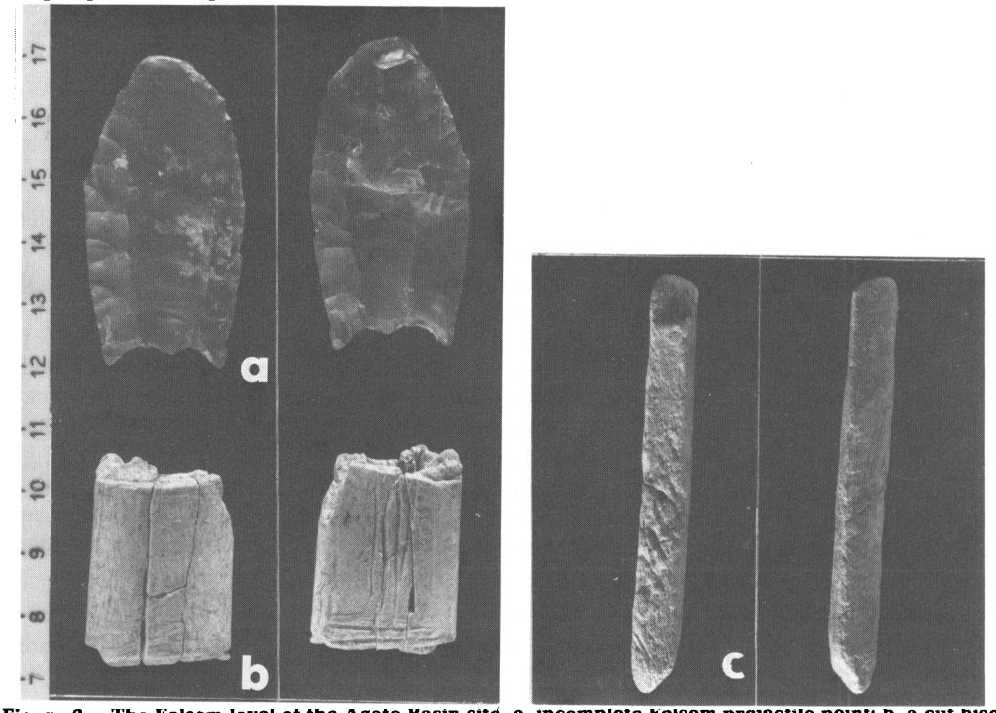

Figure 2. The Folsom level at the Agate Basin site. a, incomplete Folsom projectile point; b, a cut bison rib; and c, the base of a bone projectile point.

Recovered in the bison carcasses were parts of three fluted points and, of particular interest to students of Paleoindian animal procurement, three broken bone projectile points. To this time, there is no other known record of such projectile points in the North American archaeological record. It is felt that these are of enough significance to make other Paleoindian investigators aware of their presence at the Agate Basin site since the complete site report cannot be completed until some time in the future.

THE BONE PROJECTILE POINTS FROM THE FOLSOM COMPONENT AT AGATE BASIN

The bone projectile points were manufactured by means of two deep, parallel grooves (Figure 3) into the cancellous part of heavy long bone. The exact length of these projectile points is not known since the recovered specimens are fragmentary but would have been limited by the length of the long bone available to produce the bone slivers. A bison femur seems the most likely bone to have been used and the largest bison femur in the Folsom level (Figure 4a), obviously from a mature male animal, would have produced four or five bone points up to 30 cm long. The use of femora from females could have reduced the length as much as 4 cm. The tibia, a less tractable source of desirable bone slivers, would have yielded slivers of comparable length. Three pieces of one incomplete point (Figure 3) combine for a total of 25.4 cm, indicating that not more than 4 cm of the artifact is likely to be missing.

The distal end of the nearly complete specimen (Figure 3) was abraded to form a gradually tapering point, oval in cross section, and 9.7 and 8.5 mm in maximum and minimum diameter at a distance of 8 cm from the distal end. A small but undetermined amount of the tip is missing. Tool marks are present (Figure 3), which indicates the desired shape was acquired by use of a coarse abrading tool that did not remove all evidence of the deep groving. The depth and angles of the manufacturing grooves of one of the proximal ends match closely those on the distal end, leaving little doubt that the two pieces are parts of the same weapon even though part of the central portion is missing. Toward the proximal end, the round cross section changes and gradually becomes somewhat rectangular with maximum dimensions of 9.2 and 10.1 mm. The cross section at the extreme proximal end remains rectangular but the dimensions are further reduced to 6.1 and 5.2 mm, presumably for easier insertion into the end of a foreshaft. The extreme proximal end is also asymmetrical in outline as the result of the base being cut off at an angle. Another nearly identical base fragment 6.6 cm in length (Figure 2c) was recovered that is 7.5 and 5.1 mm at the extreme proximal end. It demonstrates also the same grooving and asymmetrical base as the first specimen. Two other fragments combine to form 10.9 cm of the tip of another specimen similar to that in Figure 3.

FUNCTIONAL ASPECTS OF THE BONE PROJECTILE POINTS

These point fragments demonstrate the kind of breakage that could have resulted from the stresses encountered while driving the long projectile point into the animal by the thrust of the spear shaft. In fact, it is identical to breaks induced in an experimental point. When driven into

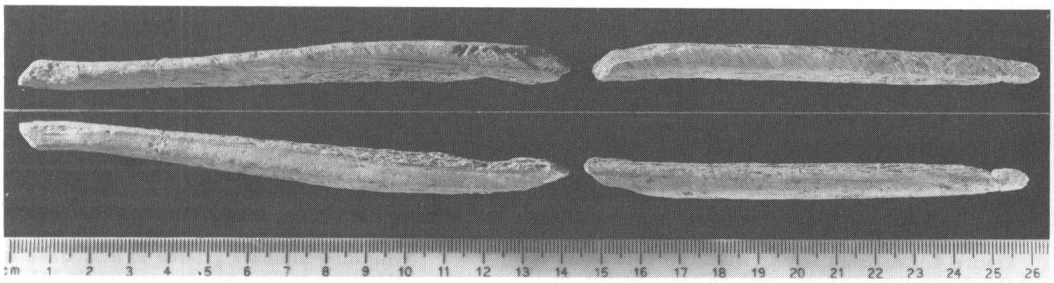

Figure 3. Bone projectile point from the Folsom level at the Agate Basin site.

the rib cage of a freshly killed elk, the experimental point (Figure 5a) broke as the angle of entry changed in going around a rib. Even so, good penetration of the rib cage was accomplished.

This evidence from the main Folsom level at the Agate Basin site in northeastern Wyoming strongly suggests that bone points here were an integral part of the bison procurement strategy. There is a good deal of homogeneity suggested in Folsom over wide areas as expressed in Folsom lithic technology. The same homogeneity should be expected in bone technology and animal procurement. This implies that similar bone points are to be expected in other Folsom bison kill sites.

The authors are well aware of bone objects from Clovis sites on the Plains that have been postulated as being either projectile points and/or foreshafts (see, e.g., Lahren and Bonnichsen 1974; Hester 1972:117; Sellards 1952:33). An ivory object of this nature recovered from a Clovis level at the Agate Basin site (Figure 6) bears little resemblance to the ones recovered from the bison carcasses in the Folsom level. The Clovis point or foreshaft is nearly round, and if it were manufactured from a piece of ivory formed by grooving and splintering, all evidence of this has been removed. A single bevel is present on one end and the breakage on the opposite end suggests it was used as a projectile point rather than as a foreshaft. It seems very unlikely that either the Clovis or the Folsom specimens can be regarded as any kind of foreshaft.

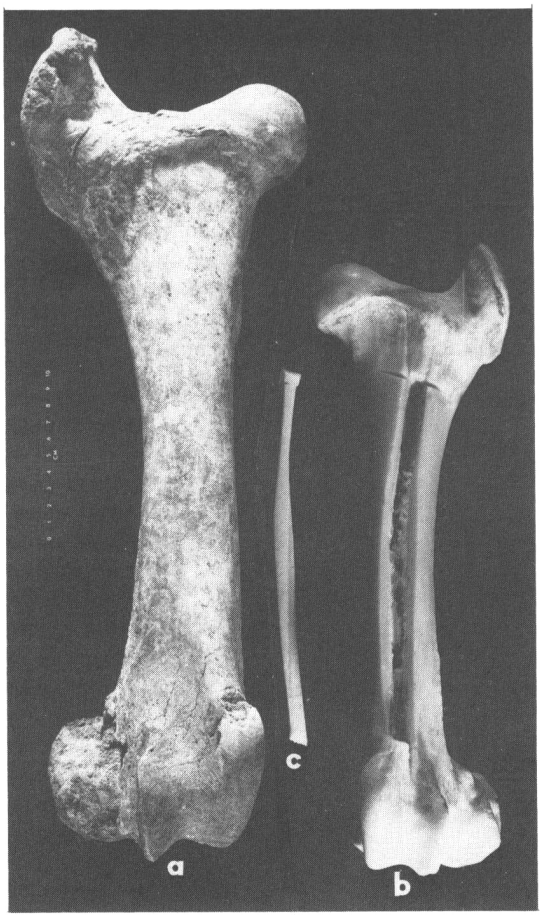

Figure 4. a, bison femur from the Folsom level at the Agate Basin site; b, modern bison femur; and c, a bone sliver removed by grooving.

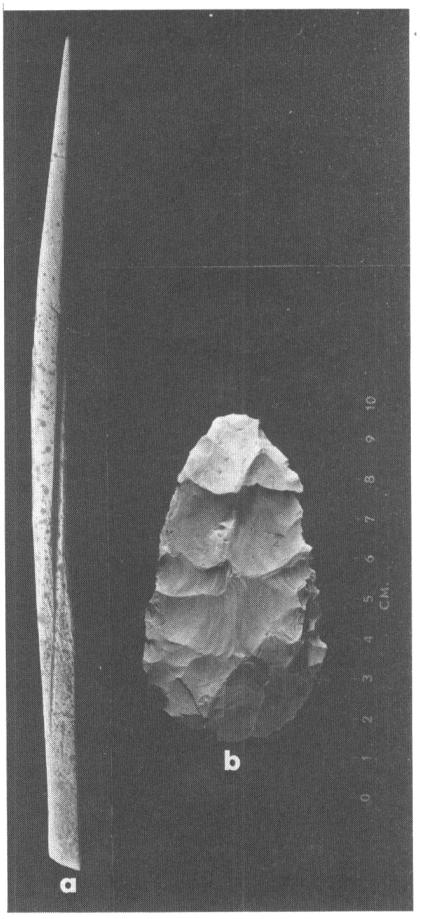

Figure 5. a, bone projectile point made from the bone sliver in Figure 4c (the long shallow groove is a mistake in placing a manufacture groove); b, biface used in manufacture.

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The use of both stone and bone points in the actual killing of bison during Folsom times has many implications. This could have been a matter of personal preference. Experiments show that bone projectile points are superior to stone points in terms of deep penetration. On the other hand, the wide Folsom point with its sharp blade edges cuts a large hole and any movement of the animal after the initial penetration results in expansion of the original wound, especially if the projectile point entered the rib cage. It is reasonable to assume also that the hunting at the site was a group effort and that spearing bison with a calculated combination of bone and stone points was a proven and successful hunting method. Experiments in spearing present-day bison with stone projectile points (Frison 1978:329–341) have provided abundant information about the effectiveness of various stone projectile points, but the proper experiments have not yet been made to become aware of the killing effectiveness of bone points.

However, weaponry used in hunting is no better than its care in preparation and the skill of the hunter during use. The fluted Folsom point may have been the result of a calculated manufacturing process to produce a piece of weaponry that provided superior hafting qualities or the fluting process may have been for other purposes. There is no doubt that hafting was critical. From actual experiments on bison and domestic cattle, an improperly hafted projectile point can easily result in failure to procure the animal. On the other hand, the proper hafting of a projectile point can be achieved relatively easily.

Bone projectile points, like stone points, required care in hafting. One bit of evidence associated with the Folsom bone points at the Agate Basin site suggests that a bone socket may have been intermediate between the bone point and the shaft. A piece of bison rib cut transversely in two places (Figure 2b) has a hollow center that accommodates the base of the two bone points. The cancellous bone of the bison rib would have provided a readily achieved means of hafting in that the proximal end of the projectile point could be easily forced into it. If this method was used, the section of rib would have been fitted solidly to the end of a foreshaft, which can be done without too much difficulty. This is also highly conjectural and the cut bison rib may have been used for a different purpose. The rib hafting device would certainly have had an adverse effect of limiting the distance of penetration. Hafting directly to a wooden foreshaft can be accomplished relatively easily using a socketed or a split foreshaft.

EXPERIMENTAL MANUFACTURE AND USE OF A BONE PROJECTILE POINT

The specific bone used to provide the raw material used in the manufacture of the bone projectile points from the Folsom bison kill at the Agate Basin site cannot be determined, but the most likely candidate is a bison femur. A less likely posssibility is a bison tibia or radius. Another possibility to consider is that camel long bones were used since camels were still around on the Plains until after Folsom times (see Frison et al. 1978).

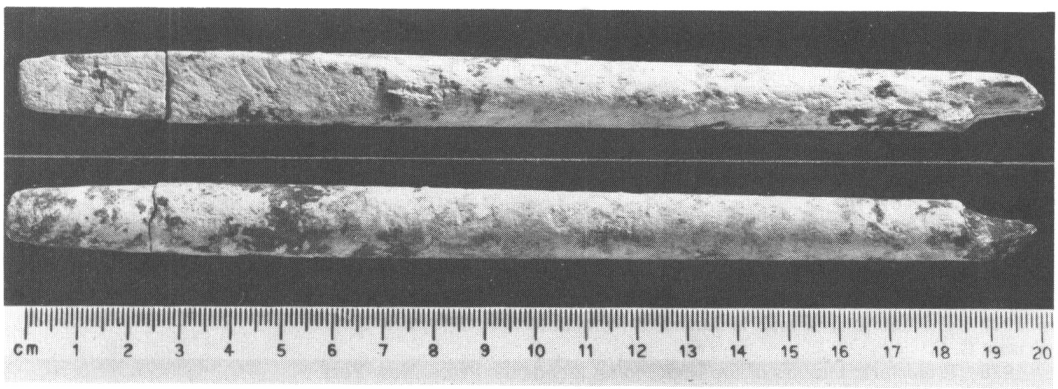

Figure 6. Ivory projectile point from a Clovis level in the Agate Basin site locality.

The replication and use of stone and bone tools and weaponry provides an added dimension for meaningful interpretations beyond that offered by a study of function based on artifact morphologies alone. With this in mind, a projectile point (Figure 5) was made from a bone splinter (Figure 4c) produced by two deep, parallel grooves in the anterior part of the diaphysis of the femur of a recently killed female *Bison bison* (Figure 4b). The grooves were made with a chert biface and accomplished in about 2.5 hours. The entire circumference of the biface was used and the edges suffered considerable damage (Figure 5). This is not a claim that Folsom manufacturers used bifaces for bone grooving purposes. It is to demonstrate only that a biface can be used successfully for this purpose. The bone, however, was quite dry; a fresher bone or one soaked in water for a period of time could be easier to groove. Grinding the bone to the final shape (on a coarse sandstone slab) required about another hour's work. Other projectile points from the same long bone would require only a single groove to produce the necessary splinter, which reduces significantly the time factor involved.

The resulting bone projectile (Figure 5a) was several centimeters shorter than the original from the Folsom level. However, the femur of the modern female bison from which the bone sliver was obtained (Figure 4b) is considerably smaller than a femur from one of the bison killed at the site which is almost certainly from a mature male (Figure 4a). The shaft of the latter is larger in diameter and also presents a more favorable surface for grooving. Except for being shorter, the experimental point is almost identical to the original site specimen. Experiments on a dead animal indicate it to be entirely adequate as part of a lethal weaponry assemblage for use on large animals.

CONCLUSIONS

Bone projectile points recovered in a Folsom cultural complex bison kill expand our knowledge of Paleoindian bison procurement methods. Although bone projectile points of this nature have not yet been reported from other Folsom animal kills, we should now expect to find them as well as evidence of their manufacture. Considerable effort in manufacture was involved as can be easily confirmed by cutting the necessary grooves in heavy bison long bone. The efficiency of bone points of this nature in the actual killing of bison has not been properly tested as have stone projectile points, but their ability to penetrate deep into large animals such as bison has been demonstrated. Experiments with dead animals do indicate that a bone point of this nature can penetrate deeply between the vertebrae more easily than a stone point and, if properly placed, would have incapacitated a large animal such as a late Pleistocene bison as effectively as a fluted stone projectile point. The effectiveness of prehistoric weaponry attains considerable importance in animal procurement models and these largely determine past subsistence strategies on the Plains.

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