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A FOLSOM COMPLEX

PRELIMINARY REPORT ON INVESTIGATIONS AT THE LINDENMEIER SITE IN NORTHERN COLORADO

(With 16 Plates)

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INTRODUCTION

Investigations at the site that yielded the first definite complex of stone implements attributable to so-called Folsom Man came as the culmination of an interesting series of events that began in May 1934. In that month D. I. Bushnell, Jr., collaborator in anthropology, United States National Museum, discovered in two collections gathered from various parts of Virginia examples of the type of projectile point which has been called Folsom. Announcement of this fact was made by the Smithsonian Institution in one of its press releases. The article, with photographs of the specimens, was printed in slightly revised form in the Literary Digest for June 9, 1934. This notice loosed a veritable flood of letters, and queries poured in from collectors all over the country. There was some confusion about what constituted a Folsom point, and the editors of the Digest felt that a second article, one describing its characteristics in detail, was advisable. In response to a request from them the writer prepared a statement which appeared in the issue for July 28. The latter brought letters from many parts of the United States from people who had examples of the Folsom type.

Among the letters were several which were received indirectly. Maj. Roy G. Coffin, professor of geology at Colorado State College, Fort Collins, had on two occasions, prior to the Digest articles, written to Dr. John B. Reeside, Jr., geologist in charge, section of stratigraphy and paleontology, United States Geological Survey, concerning a site in northern Colorado. At that place he and a brother had found a considerable number of Folsom points, several other kinds of chipped tools, and indications that the implements had been made on the spot. Following the appearance of the second Digest article, Major Coffin again wrote to Dr. Reeside. The latter brought the correspondence to the attention of Henry B. Collins, Jr., division of anthropology, U. S.

National Museum, and he in turn transmitted the information to the Bureau of American Ethnology. Several letters were exchanged between the writer and Major Coffin, and as a result of the correspondence it was decided that a first-hand inspection of the site was advisable. In September the writer was sent to Fort Collins. The owner of the land, William Lindenmeier, Jr., gave permission for a series of investigations, and preliminary prospecting was started.

The site is north of Fort Collins, Colo., just south of the Wyoming line. It was first discovered in 1924 by Judge C. C. Coffin and his son A. L. Coffin. Since then they and Major Coffin, with various friends, have visited it from time to time and have collected numerous specimens. When the writer went to Fort Collins, they had gathered 83 points or portions of points and about the same number of other artifacts. From the very beginning of their finds the Coffins were impressed with the fact that all of the points picked up at this location differed from the usual Indian arrowheads which are so abundant in that general region. Although they were convinced that the points constituted a distinct type, they were not aware of their true significance until informed by Dr. E. B. Renaud, of the University of Denver, that they were Folsom points.

In the summer of 1930 Dr. Renaud and a number of his students, under a project sponsored by the Smithsonian Institution Cooperative Fund, the University of Denver, and the Colorado Museum of Natural History, were making a survey of local collections and of former village sites in Colorado and adjacent regions. Their purpose was to plot distribution maps for various types of implements, with the places where they were found. It was during these investigations that the Coffin series was noted.[1] In June 1931 Dr. Renaud visited the location from which the artifacts came, and he describes it briefly in one of his reports.[2] No digging was done, but portions of two Folsom points were picked up from the surface at that time. The Coffins continued their visits intermittently and added specimens to their collections. Most of the material was picked up from the surface, but a few pieces were scratched out of the soil. No extensive work was attempted until the autumn of 1934.

The place where the points and other implements were found by the Coffins is a denuded area approximately 70 by 150 yards in extent. The bulk of the material came from a small section covering only about 30 square yards. The surface over a greater portion of this site

[1] Renaud, 1931 a, p. 17.

[2] Renaud, 1932 a, pp. 27-28.

is the top of a hard, compact layer of grayish earth. The artifacts recovered from it had undoubtedly been in top-level material which was eroded away by wind and water. The implements, because of their weight, had remained until picked up. In some places, there remained portions of the sand, gravel, and nodule layer which had overlain the compact deposit, and a few objects were found on the contact line between the two. This part of the site did not offer any particular inducements for digging, especially if it was desired to find material in situ. At the close of the first day's inspection the writer was not sanguine over the prospects for getting information beyond that already obtained by Judge Coffin and Major Coffin.

On the second day, however, when the writer, with Judge Coffin and his son, was exploring the adjacent terrain, the Judge picked up a portion of a Folsom point along the bank of a ravine which cuts through the terrace some distance above the original site. Close inspection of the precipitous bank in the vicinity of this find revealed an undisturbed and intact layer of midden material 14 feet below the present ground level and 12 feet above the bed of the gully. A brief investigation demonstrated that the deposit, which is a quarter of a mile away from the spot where the majority of the Coffin specimens was found, was a likely place for excavation. Work was started and continued through the month of October and into the first part of November. Some digging was done at other portions of the site, but the major activity was restricted to the deep pit in the gully bank where most of the specimens described in following pages were found.

The type of point called Folsom has been known for a long time. Variations of the form have been found from the Rockies to the Atlantic, from southern Canada to the Gulf of Mexico. It is represented in collections in numerous museums and in at least one case has been called by another name, the Seneca River point. Except for a few instances,[3] it did not attract particular attention despite its peculiar characteristics. This was in part due to the fact that most of the examples were surface finds. Its true significance was established in 1927, and the interest focused upon it brought to light many which had previously passed unnoticed.

Because of a certain amount of confusion and misunderstanding concerning the original Folsom finds, a brief review of the subject is germane to the present discussion. In the summer of 1925 Fred J. Howarth and Carl Schwachheim of Raton, N. Mex., both now de-

[3] Beauchamp, 1897, figs. 13, 14, p. 21. Brown, 1926, fig. 45, p. 138. Thruston, 1890, fig. 139, pp. 231-232.

ceased, notified Director J. D. Figgins of the Colorado Museum of Natural History, Denver, of a bone deposit which they had found in the bank of an arroyo on the upper sources of the Cimarron River near the town of Folsom in eastern New Mexico. Samples of bone sent to the museum indicated that the remains were those of an extinct species of bison and of a large deerlike member of the *Cervidae*. Prospects for fossil material were so promising that the Colorado Museum sent a party to the site in the summer of 1926. During the course of the excavations, carried on under the supervision of Frank Figgins and Mr. Schwachheim, parts of two finely chipped projectile points were recovered from the loose dirt at the diggings. Near the place where one of them had been dislodged a small, triangular piece of "flint" was found embedded in the clay surrounding an animal bone. This fragment was left in the block of earth, and when the latter was received in the laboratory at Denver, the dirt was carefully cleaned away from the bit of stone. It appeared to be from the same material as one of the points, and close examination showed that it actually was a part of the point. This evidence seemed unquestionably to demonstrate that here was a definite association between man-made objects and an extinct bison.[4]

Director Figgins was so impressed with the find and was so thoroughly convinced that it was of importance to students of American archeology that he took the points with him that winter when he visited several of the large eastern museums on paleontologic business. In most places his announcement was courteously yet skeptically received. One authority on stone implements marveled at the quality of workmanship that the specimens exhibited and even remarked that they were reminiscent of the finest examples from Western Europe. He was doubtful, though, of the trustworthiness of the association. He thought that it could perhaps be attributed to an accidental mixing of material. Others said that the points had no significance because they could be duplicated in existing collections. At a few museums, notably the American Museum of Natural History, Mr. Figgins was urged to continue the work in the hope that additional evidence could be obtained.

The Colorado Museum again sent a party to Folsom in the summer of 1927 and had the good fortune to find additional points. One of these was noted before it was removed from the matrix, even before it was completely uncovered. Work was stopped immediately on that part of the excavation, and telegrams were dispatched to various

[4] Cook, 1927. Figgins, 1927.

museums and institutions inviting them to send representatives to view the point in situ. The writer at that time was attending the first Southwestern Archeological Conference at Pecos, N. Mex., and, upon receiving notice of the find and travel instructions from Washington, proceeded to Folsom. Arriving at the fossil pit, on September 2, he found Director Figgins, several members of the Colorado Museum board, and Dr. Barnum Brown, of the American Museum of Natural History, New York, on the ground. The point, which became the pattern and furnished the name for the type, had just been uncovered by Dr. Brown. There was no question but that here was the evidence of an authentic association. The point was still embedded in the matrix between two of the ribs of the animal skeleton. In fact it has never been removed from the block, which is now on exhibit in the Colorado Museum at Denver. On returning to Raton, N. Mex., that evening, the writer telegraphed to Dr. A. V. Kidder at Pecos and urged that he visit the site. Dr. Kidder arrived 2 days later, and he and the writer drove out to the bison quarry. After the whole situation had been carefully studied, it was agreed that the association could not be questioned. Furthermore, it was ascertained that the points were totally different from the ordinary types scattered over that portion of the Southwest.

At the meeting of the American Anthropological Association held at Andover, Mass., in December of that year Dr. Barnum Brown and the writer reported on the Folsom finds. There was considerable discussion of the subject, and although many agreed that the discoveries were important, there was still a general feeling of doubt. Numerous explanations were offered to show that the points might have gotten into such an association without actually being contemporaneous with the bison remains. Several mentioned that points of that type were numerous in collections from certain mound sites, from village sites in New York State, and elsewhere, and for that reason they could not be very old. Others insisted that, although they accepted the conclusions on the genuineness of the finds, there must be some mistake about the antiquity of the animal remains.

The summer of 1928 saw the American Museum of Natural History and the Colorado Museum cooperating at the Folsom site. The expedition was under the leadership of Dr. Barnum Brown, who was assisted by several graduate students in anthropology. The latter were under the general supervision of Dr. Clark Wissler. Additional points and bison skeletons were found, and telegrams reporting the discoveries were sent to various institutions. This time numerous special-

ists—archeologists, paleontologists, and geologists—rushed to see the evidence. The consensus of the informal conference held at the site was that this constituted the most important contribution yet made to American archeology. Some of the most skeptical critics of the year before became enthusiastic converts. The Folsom find was accepted as a reliable indication that man was present in the Southwest at an earlier period than was previously supposed.

In subsequent years there has been considerable activity on the part of those interested in tracing the distribution of the type of point found there. Some have endeavored, without marked success, to find new locations where further evidence could be obtained in situ. Others have been content to make surveys showing the occurrence of the type. There have been a few significant discoveries, but most of the information thus far available concerns material found on the surface. The latter is of value from the standpoint of distributional studies, as an indication of likely spots for intensive work, and in showing local variations in the type. Yet, so far as chronological significance is concerned, it has added little to the knowledge gained at Folsom. The most important contributions have come from sites in New Mexico, where E. B. Howard, of the University of Pennsylvania Museum, has been engaged in a series of investigations. In a cave in the Guadalupe Mountains in the southeastern part of the State he found a Folsom point in conjunction with musk ox and an animal of the musk ox group.[5] The musk ox is a cold-climate animal and when found as far south as New Mexico, is generally considered good evidence of an ice-age fauna. The association was of further significance because it occurred in a stratum underlying a level containing Basket Maker material. The latter belongs to the oldest definitely established horizon in the culture-pattern sequence in the Pueblo area of the Southwest. This is a good indication that the points antedate the Basket Makers.

Near Clovis, N. Mex., Mr. Howard has been exploring a site where large numbers of chipped implements, including Folsom specimens,[6] and bones of extinct species of animals are found together. The chief difficulty at this location, however, is that the material occurs in what are known as "blow-outs," places where all of the top soil has been carried away by action of the wind. For that reason accurate indications on associations are hard to obtain. The finds are in old lake beds, and the geologic evidence is of significance. At the time of the pres-

[5] Howard, 1932.

[6] Anonymous, 1932; 1933. Howard, 1933; 1934, fig. 1.

ent writing, official reports on the Clovis work have not been published; hence, reference can be made only to the investigations.

The exinct bison from the fossil pit at Folsom, *Bison taylori*[7] (*Stelabison occidentalis taylori* and *Bison oliverhayi*[8]), are considered to be Pleistocene forms, animals that were living in the glacial period. This fact, coupled with the finding of points in association with bones of the musk ox and of other extinct bison in additional localities, furnishes the basis for the conclusion that the Folsom points represent considerable antiquity. This belief is substantiated by the fact that at a number of sites points bearing certain characteristics of the true Folsom type, yet not definitely assignable to that class, have been found with remains of extinct species of animals. One of the sites best illustrating this phase of the problem was that at Dent, Colo., where two points, one of which is decidedly Folsomoid, came from a deposit containing mammoth bones.[9] Several pits in Nebraska and Kansas have yielded points, in some cases with mammoth bones and in others with bison bones.[10] Near Colorado, Tex., an articulated skeleton of an extinct bison and some chipped points were recovered from a reputedly Pleistocene deposit.[11] Although the majority of the blades in this group of finds are not primarily Folsom in type, the conditions under which they were discovered tend to substantiate the Folsom evidence for an early occupation of the New World. In the latter connection, though they have no bearing on the Folsom problem proper, might be mentioned an association of man-made objects and traces of the ground sloth in Nevada,[12] and human bones with sloth remains near Bishop's Cap, N. Mex.[13] These occurrences are additional contributions on the "antiquity of man" in the Southwest. Whether all of this evidence from the various places mentioned actually dates man in the closing days of the Pleistocene, indicates his presence at the beginning of the post-glacial period, or demonstrates a later survival of ice-age animals is a phase of the problem which the geologist and paleontologist must solve.[14] Some insist that the evidence unequivocally proves that man was here in the Pleistocene, others that he came during the transition between the glacial and

[7] Hay and Cook, 1930.
[8] Figgins, 1933 b.
[9] Figgins, 1933 a.
[10] Bell and Van Royen, 1934. Schultz, 1932 (contains lengthy bibliography).
[11] Figgins, 1927.
[12] Harrington, 1933.
[13] Bryan, 1929. Thone, 1929.
[14] For a discussion of this subject see Antevs, 1935.

Recent periods, but was not actually here in the ice age. All agree that more data are essential. Archeologists generally concede that the points belong to the earliest phase of aboriginal culture yet discovered in America.

Distributional studies have demonstrated several facts. The most significant of these is that there are two main classes of Folsom type points: the true Folsom, and a larger, more generalized form embodying most of its characteristics but not exhibiting the skilful workmanship or mastery of the stone-chipping technique apparent on the true example. Present evidence is that the true Folsom is restricted to the strip of terrain, known as the High Plains, extending along the eastern slopes of the Rockies. The other form not only occurs in the High Plains but is widely distributed across the eastern portion of the United States.[15] There are several places about which the latter seems to center, notably the Finger Lakes section in New York State, in Ohio, Tennessee, and southern Virginia. Sporadic examples have come to light in various localities in practically every State east of the Rockies and in portions of southern Canada. The problem of distribution for the eastern area received considerable attention several years ago from Alfred Kidder, II, then a graduate student at Harvard University. E. B. Howard began his studies at about the same time, and when Kidder's interests were turned to other fields, his unpublished manuscript and all of his information were turned over to Howard. The latter is still actively engaged in the study.

From the letters, photographs, and actual specimens sent to Mr. Bushnell and to the writer, following the publication of the Digest articles and press notices of the work in Colorado, much more information has been added to the data on the occurrence of the eastern type. This work is still being continued, and a tabulation of the results and a consideration of their significance will be incorporated in a larger and more comprehensive study of the subject. It is in this connection that investigators must face the problem of whether the generalized form indicates an earlier phase which reached its perfection in the true Folsom or whether it represents a degenerate and later variation. Another aspect of this phase of the study is the diffusion of the type. There is the possibility that it traveled south along the cordillera, then swept east and north. On the other hand the two forms may represent off shoots from an original basic type which spread along two separate lines, one skirting the eastern slopes of the mountains, the other moving eastward and then south.

[15] Howard, 1934, pp. 13-14.

Studies of distribution in the area adjacent to the Rockies are being carried on by Dr. Renaud and several of his students. Others are interested in the problem but are not actively engaged in the work. In the course of his surveys Renaud noted a type of implement which, in some districts, apparently occurs in conjunction with the Folsom points. Because the largest and finest series of this other type to pass under his observation was in an extensive collection at Yuma, Colo., he named it the Yuma type.[16] Yuma and Folsom points are found together at many sites as surface material, and their association no doubt has some significance, although just what it may be is not now apparent. On the basis of typology Renaud considers the Yuma older than the Folsom.[17] Others, notably Mr. Figgins,[18] do not agree. The age of the Yuma type has not been satisfactorily established, though one find of a debatable nature is frequently cited as proof of the antiquity of the form,[19] and another is still under discussion.[20] Since neither the Folsom pit nor the Lindenmeier site yielded Yuma points, further consideration and detailed descriptions of them are beyond the requirements of this paper. It was deemed advisable to mention them because the two names so frequently appear together. Persons interested in the Yuma types will find them described in Renaud's papers.

The importance of the Lindenmeier site lies in the fact that for the first time traces of an occupation level which can be assigned to a group of Folsom men have been brought to light. Whereas prior to the work in northern Colorado the only indications of this presumably early hunting people were typically chipped stone points, there is now a definite complex of associated implements. The last few years have been marked by much loose talk and writing about the "Folsom Race," the "Folsom Culture," and "Folsom Man," when actually all that was known was the characteristic point. From a strict anthropological point of view it is still incorrect to speak of "Folsom Culture" because the remains so designated probably should be considered only as one aspect of a basic, widespread early hunting pattern which may have extended across the eastern half of the continent. So far as Folsom Man himself is concerned, he is still persona incognita. No skeletal material that can properly be assigned to him has to date been discovered. Recent reports of a Folsom Man in Minnesota

[16] Renaud, 1932 b, p. 1.
[17] Renaud, 1931 a, p. 15; 1934 b, p. 2.
[18] Figgins, 1934.
[19] Cook, 1931.
[20] Barbour and Schultz, 1932. Bell and Van Royen, 1934. Figgins, 1934.

cannot, in the opinion of the writer, be accepted as evidence of such a find, because published illustrations of the points found with the human bones indicate that they are not Folsom, either of the true type or of the widely distributed generalized form. Nor are they Yuma, although identification of the skeleton as Folsom Man is based on the deduction that the points are Folsom in outline and Yuma in flaking, and hence intermediate in time and development between the two.[21] In view of the status of the Yuma, as discussed in a preceding paragraph, a form midway between it and the Folsom is not particularly significant. The Minnesota man may represent a local aspect of the general hunting culture of the period indicated by Folsom; he may even be older. That is beyond the question here at issue, namely, that present evidence does not show him to be Folsom Man.

Not only has the Lindenmeier site furnished a variety of implements for the Folsom horizon, but in addition there are numerous stone flakes,—typical workshop debris. These occur in the deposits with the tools and give mute but accurate evidence of much of the technique employed in the manufacture of the implements. Furthermore, the numerous spalls, nodules, and large cores indicate that the stone working was done on the spot. Considerable raw material was available in the neighborhood, and this may have been one of the attractions which led to the occupation of the site. Other items influencing this choice probably were the presence of a large spring and an abundance of game animals. The midden deposit contained quantities of cut and split bones. This material is very scrappy in its nature, but nevertheless it has been possible to identify some of the animals represented. Two of the species contribute support to the belief that the Folsom complex represents an appreciable antiquity. There is also the chance that better bone specimens will be obtained there and that more animals will be represented, thus increasing the information on that phase of the problem. The site holds possibilities from a geologic point of view, and it is hoped that careful studies by a number of specialists will give an accurate indication of the probable age of the deposits.

Great credit is due Judge Coffin and his son for the discovery of this site and to the Judge and his brother, Major Coffin, for their efforts to protect it and bring it to the attention of the scientific world. Their whole-hearted cooperation during the investigations by the writer facilitated the work and made possible better results than would otherwise have been attained in so short a time. A. L. Coffin assisted

[21] Anonymous, 1934 a; 1934 b. Jenks, 1934; 1935, pp. 7-11.

in the digging throughout the period that the excavations were being made. The kindness of Mr. Lindenmeier in granting permission to work on his land is deeply appreciated.

THE LINDENMEIER SITE

The Lindenmeier site, where the specimens described in the following pages were found, is 28 miles (45.062 km) north of Fort Collins, Colo., and $1\frac{3}{4}$ miles (2.816 km) south of the Wyoming line. Specifically, it lies in sec. 27, T. 12 N., R. 69 W., sixth principal meridian. The site is on a terrace (pl. 1, frontispiece) above the valley of an intermittent tributary to a series of creeks which ultimately join the South Platte River. Whether this is a part of the old terrace system of the Platte, which is being extensively studied by geologists in the region farther east, is still to be determined. The formation is generally called the White River. It consists of a bed of grayish clay covered with a conglomerate composed of sand, gravel, and occasional large boulders. The clay is a Tertiary deposit, Oligocene, with a possible admixture of some volcanic ash. The capping conglomerate is indeterminate in age. It may be rather old, or it may be comparatively recent.

The Lindenmeier site presents an interesting geologic problem in the question of the wearing away and building up of the terrain. The man-made material and animal bones occur in a dark soil layer which rests on the clay bed and underlies the conglomerate. A tentative reconstruction of the topography at the site, based entirely upon the writer's interpretation of conditions and not upon observations by a competent geologist, suggests that at one time there was a short, narrow valley lying between a series of conglomerate-topped ridges, a situation comparable to that existing today at no great distance above the archeological location. (See pl. 2, fig. 1.) The valley bottom consisted of a soil layer, several inches in thickness, resting on the Oligocene deposit. Here and there were small ponds or marshy places, as indicated by the siltlike strata of dark soil in depressions in the clay bed. The human occupants of the valley lived on top of this soil layer. As a result of their continued presence, numerous objects associated with their daily round of life—charcoal and ashes from their fires, bones from the animals that supplied the meat for their meals, stone chips from the implements that they made, broken tools and other artifacts—were scattered over the surface. These in time became embedded in the rising soil level, were subsequently buried by additional soil layers after the people departed, and eventually were covered by

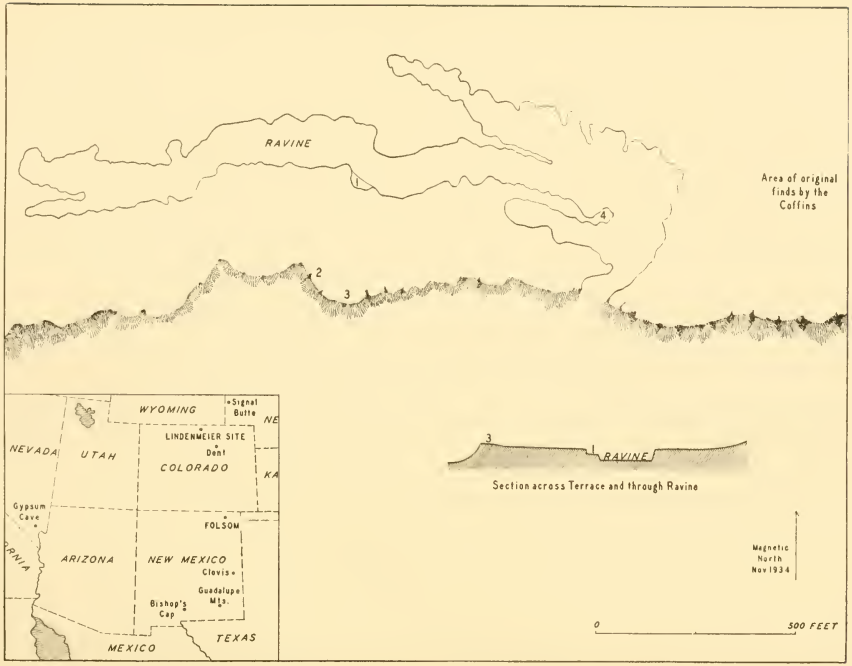

FIG. 1.—Sketch map of the Lindenmeier Site. 1, location of deep deposit; 2 and 3, places where bones and "flints" were found; 4, implements obtained at this spot. Insert shows location of the site with respect to other finds indicative of considerable antiquity.

the present overburden when sand, gravel, and boulders were swept down into the valley from its bordering hills. Later, water, coursing its way down the hillsides and along the valley, cut the gully in whose banks the midden deposit was revealed.

The present ravine is only one of several channels which have from time to time been worn in that portion of the terrain. Traces of other water courses which did not cut so deeply into the valley fill are apparent in the sides of the gully. One old channel passed directly over the top of a portion of the layer in which most of the stone and bone material was found. It did not wear its way down into the old soil line but stopped a few inches above it and then began to build up. It gradually became filled, until, so far as surface indications are concerned, it was completely obliterated. The direction of the old channel at this point had been almost at right angles to the now existing gully. In character the former suggests a meandering stream, one which probably continued to the lower end of the valley a mile or so east of the mouth of the channel of today. The filling of the stream bed may have resulted from damming by alluvial gravels washed in from one of the side canyons near its mouth. Considerable time is probably represented by all this action, although conditions in the West are such that channel cutting, filling, and shifting may occur in a relatively short period of years. Other factors indicate that the process here could not have been extremely rapid because ridges from which some of the valley fill was eroded have since completely disappeared, having been weathered away in the opposite direction. This is shown by the fact that the soil layer—the artifact-bearing stratum—topping the clay bed is still on the upslope, where it appears along the edge of the terrace above the broad valley to the south of the site. The complete erosion of the ridge transformed the level from a valley bottom to what may possibly be considered to be a terrace.

One aspect of the problem which is of interest, although it bears only indirectly on the archeological factor, concerns the original scouring of the valley bottom and removal of material down to the Oligocene stratum. Whether this resulted from action by mountain glaciers, by water from them, or from some more recent agent is one of the many phases of the subject which geologic studies may explain. Should it be established that the Oligocene deposit was laid bare at the time of the great mountain glaciers, which are considered to have been contemporaneous with the Wisconsin ice sheet, a significant inference could be drawn, namely, that makers of the implements arrived on the scene not long after the retreat of the ice, since evidence of their

presence occurs immediately above the eroded surface. This would place the occupation of the locality at the beginning of the present geologic period. Although speculation of this nature suggests interesting possibilities, it must be borne in mind that it is only conjecture and that careful examination of the deposits by specialists may result in entirely different conclusions. The chief purpose of this suppositious reconstruction is to call attention to some of the questions raised by conditions at the site.

Preliminary prospecting indicated that the main concentration of archeological material occurs in the strip of land lying between the present gully and the edge of the terrace (fig. 1). The area is approximately 250 yards (228.6 m) long by 100 yards (91.44 m) wide. The artifact-bearing stratum varies in depth below the surface. Along the edge of the terrace its average depth approximates 2 feet (60.96 cm), increasing rapidly toward the bank of the gully, where it is 14 feet (4.267 m) below the present surface at the place where most of the digging was done. (See pl. 2, fig. 2.) It is 6 feet (1.828 m) down from the top at the mouth of the ravine. The difference in depth between the upper and lower ends along the bank is due not so much to variation in the old soil line level as to the slope of the present surface. Digging at a number of places, both along the edge of the terrace and in the sides of the ravine, yielded stone implements and broken animal bones. The specimens occurred in greatest numbers at the deepest point, however, and for that reason most of the preliminary work was restricted to that portion of the deposit. The material at this location suggested a midden or refuse layer, whereas that from other portions of the site was more of the nature of chance accumulations. The objects, bone and stone, were found for the most part just above the clay stratum in a layer 6 inches (15.24 cm) to 1 foot (30.48 cm) in thickness (pl. 3). Some were lying flat at the line of contact between the layers, others extended down into the top of the clay as intrusions.

The deep level, where most of the work was done, seemingly constituted the peripheral vestiges of one of the depressions in the top of the clay bed, as mentioned in a preceding paragraph. It suggested that the material had been deposited along the edges of a shallow pond or a marshy spot. The main portion of the old depression was washed away when the present ravine was formed. A wedge-shaped excavation was driven into the bank following along the top of the clay bed. Because of the large amount of overburden to be removed, the necessity for extremely careful digging, and the short time available for

the investigations, only a small area was uncovered. It measured 53 feet (16.154 m) along the ravine, extended into the bank 38 feet (11.582 m) on one side and 26 feet 6 inches (8.077 m) on the other. In view of the small size of the excavation the number of specimens obtained was gratifying both as to quantity and variety.

In the following descriptions of the various kinds of tools found at the Lindenmeier site, only the more general features will be considered. A detailed typological study, discussions of the technique of manufacture, and comparisons of this material with similar objects from sites not necessarily Folsom in nature are not advisable at this time, since further excavations are planned. Additional and more comprehensive evidence will no doubt be available when the investigations are completed. The various kinds of stone represented by the implements in the present group are: Chalcedony, jasper, chert, quartzite, petrified wood, moss agate, geyserite (rare), and white sandstone. The chipper's debris—flakes, cores, and nodules—also exhibits the same variety. The most popular "flints" were chalcedony and jasper. (The writer does not believe it necessary to go into the question of flint and flintlike materials in the present discussion. Where the term flint is used, it refers only to the implements, not to the particular stone involved.) The other kinds of material found in the region do not flake and chip as readily, nor do they permit as high a degree of workmanship. The recent Indians inhabiting the district made greater use of quartzite and geyserite.[22] The sandstone objects from the old horizon were not cutting or penetrating implements, but rubbing and polishing stones.

POINTS

True Folsom points occur in two forms. The better known variety, based on the first example found actually in situ at the Folsom pit, is a thin, leaf-shaped blade. The tip is slightly rounded, and the broadest part of the blade tends to occur between the tip and a line across the center of the face (fig. 2, A, a, b). A typical feature is a longitudinal groove or channel extending along each face, C, about two-thirds of the length. These grooves produce lateral ridges paralleling the edges of the blade. A cross-section of the object gives a biconcave appearance as shown in the diagram. The base is concave,

[22] Major Coffin has studied extensively the tools made by the different Indian groups which inhabited the Fort Collins area at various times and has determined most of the sources for the materials used. A summary of his findings appears in Renaud, 1931 b, p. 61.

the concavity varying in outline on different specimens, and there are frequently long, sharp base points often called "ears." Between the edges of the blade and the lateral ridges produced by the central grooves is a more or less fine marginal retouching, a secondary removal of small flakes. Points in this group tend to be somewhat stubby, as they are broad in proportion to the length. The second form, B, was present in the type site but is rarely mentioned in discussions because of the general lack of information on the subject. It is also a thin,

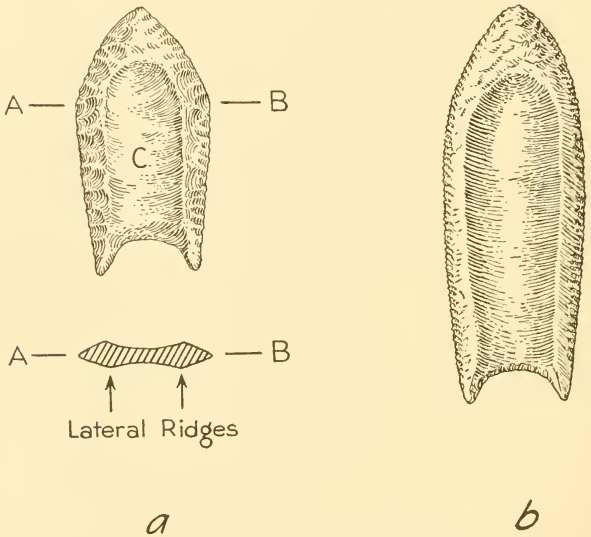

FIG. 2.—Two forms of the Folsom type point.

leaf-shaped blade with characteristic fluting on the faces. In contrast with the first form, however, it is long and slender in outline and has a tapering rather than a rounding tip. The type of base for this second form is not known from Folsom, as the specimens found there were broken, the butt ends being missing. Similar points from the Lindenmeier site have concave bases. Hence it is permissible to assume that the same was true for the specimens from the type site. It is quite possible that some of the broken bases from Folsom were from B form blades, although there is nothing to substantiate that assumption.

The various features that characterize the Folsom points may be found singly or in different combinations on specimens originating in several sections of the country, but unless all are present on each individual artifact it cannot be considered as a true example of the type. Failure to observe this fact has led to some confusion and misunderstanding. Mere concavity of the base or leaflike shape does not constitute a Folsom point. The groove is an essential feature. Whether grooves on both faces should be insisted upon is a debatable question, because in at least one of the specimens from the original site it was present on only one face. This point, or rather portion of a point, was picked up by Mr. Howard from the dump at Folsom during the summer of 1934. Except for the absence of the fluting on one side, it is in all respects characteristic of the type. It is the only example from that location which was made from quartzite, and as that material is so difficult to work, it is possible that the groove was omitted for that reason. One example from the B group at Folsom, which has been pictured a number of times, seemingly has a groove on but one side.[23] As a matter of fact the specimen in question shows that it did have a groove on each face, though one was unusually short and most of it was lost when the butt end was broken off. Just a trace of the upper end of the channel is to be observed. That so short a flake was removed was due, as the specimen clearly shows, to a flaw in the stone. This caused the flake to turn out rather close to the base instead of farther along the face. A number of fragmentary points from the Lindenmeier site have the channel on only one side. Most of these appear to be implements broken and discarded before completion, however, and for that reason are not a good criterion. In view of the evidence from Folsom, and despite the contradictory nature of such a statement, it may be said that a true Folsom point should be fluted on both sides, but an otherwise typical example may occasionally have the feature on only one side.

The rarity of perfect specimens has been commented upon in various articles on the subject of Folsom points. A large majority consists of broken examples. There was only one complete blade in the group of 19 found at Folsom, and the proportion at other sites has been even smaller. This may be attributed, as has frequently been suggested, to the brittleness caused by the fluting. The removal of the longitudinal flakes so thinned the points that they became extremely fragile. The purpose of the grooves is not known. A number of explanations have been made, and any or all may apply. Perhaps the

[23] Figgins, 1927, fig. 3.

most logical is that they were to facilitate hafting the head to the shaft of the spear or arrow. Other interpretations are that they were to reduce the weight, to improve the penetrating qualities, to permit the point to break off in the animal, to allow the head to slip out of the fore-shaft, and to promote bleeding. It is possible that a number of such ideas were contributing factors in the perfection of the type.

With the exception of two specimens, all the points or portions of points found at the Lindenmeier site are of one or the other forms of the true Folsom type. One variant is an extremely thin example which would not have permitted the removal of such flakes (pl. 5, *i;* 6 *i*). In its general outline and style of chipping it indicates a relationship to the group, but nevertheless, it cannot be considered a Folsom point. It probably represents a different type, because similar points have been found at Clovis and other sites. A single example is not sufficient for definite conclusions, but there may be some significance in the fact that this specimen was found on top of the old soil layer—not down in it as were most of the true forms. The other point that does not conform was made from a scrap flake not primarily intended for such use, and hence was not properly shaped in the beginning (pl. 7, *h;* 8, *h*). This object came from the deep deposit and was in association with typical Folsom material. It is too indeterminate in character to be considered other than an aberrant form. Furthermore, since the base edge is chipped in a fashion suggestive of a scraper rather than a projectile point, it is possible that it was one of the former.

From the time that the Folsom type and its longitudinal grooves first attracted attention there has been considerable discussion about the technique employed in the removal of the long flakes. Some have insisted that they must have been dislodged before the blades were worked down to their characteristic shape. The writer has maintained from the beginning, as have several others, that the major part of the shaping constituted the initial stage, and that the long flakes were then removed.[24] The final touch was the secondary chipping between the lateral ridges and the edges.[25] This was suggested by the fact that the longitudinal channels cut through the smaller cross grooves left by the primary shaping process. Another indication was the "hinge fracture" on the ends of broken specimens. This resulted from a reverse action on the part of the flake. Instead of turning out, it turned in and went through the blade, breaking off the tip and leaving a smooth, rounded end on the butt. There are several examples of

[24] Cook, 1928, p. 40.

[25] Renaud, 1934 b, p. 3.

this in the present collection. In one instance both the tip and the butt were found (pl. 7, *l*; 8, *l*), and another specimen exhibiting the feature has already been described in print.[26]

This proof was not sufficient to convince a number of the investigators; now, however, there is clear-cut evidence. The Lindenmeier site contributed portions of flakes which came from the longitudinal channels. The Coffins found a number of such flakes in their work, and several were obtained during the digging by the writer. Major Coffin expressed the belief that they were from the channels, and the additional specimens show this to be the case. In every instance the flakes are smooth on one side—the side that formed the groove in the blade—and flaked on the other (pl. 4). The latter surface was part of the face of a completely shaped point. Furthermore, fragments of blades broken in the process of manufacture and consequently discarded substantiate the conclusion. What may seem to be an exception to this procedure (although actually it is not) is occasionally noted. Some specimens suggest that use was made of a random flake which already had a groove on one side. With such material, all that was required was the shaping and fluting of the other face. But the same method was followed for the single side as in the making of a complete point. Examples of this nature are not common, however,

The technique of removing the long flake is not definitely known, but the scrap material from the midden gives some good clues. Both the fragments of the points and the pieces of channel flakes indicate that a hump was left in the center of the concavity when the base was chipped (fig. 3, *a*). This formed the "seat" for the implement used to eject the flake. That percussion, not mere pressure, was resorted to is evidenced by the definite bulbs of percussion on the flakes and by the reverse impressions in the bases of the points which had not been secondarily chipped. It would be extremely difficult to strike a nubbin as small as the "seat" with a hammerstone; hence it seems logical to suppose that the blow must have been an indirect one. A tool of bone or antler probably served as a punch to transmit the impact required to flip out the flake. Indirect percussion was employed by certain recent Indian stone chippers in making some of their implements,[27] and it may well have been part of the ancient technique. When the groove had been obtained on one side, the nubbin was retouched, if necessary, and the process repeated on the other side. The rechipping of the "seat" was no doubt partially responsible for the depth of the

[26] Renaud, 1934 b, p. 4.
[27] Holmes, 1919, pp. 295-296.

concavity and the length of the "ears." There is nothing to show whether the work was entirely that of a single individual or whether two were needed. It is quite possible that one held the point with the punch firmly seated at the proper spot on the nubbin while another gave a quick, sharp tap on the flaking implement with a hammerstone. This unquestionably would require skill on the part of both but probably would not be as difficult a task as though one person tried to do it alone. Present day experts in stone chipping may be able, through experimentation, to solve the problem of which would be the more efficient method. In a majority of cases a single, long flake was removed at a single blow. Occasionally the first attempt was not satis-

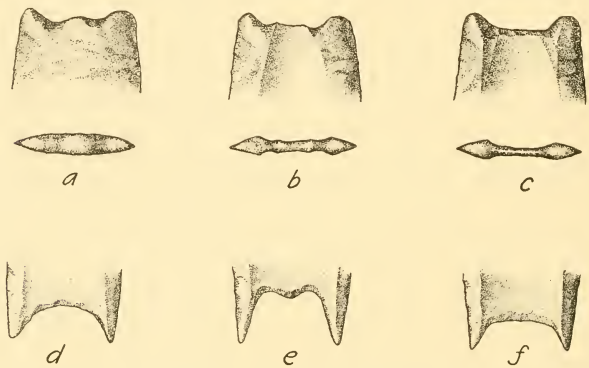

FIG. 3.—Stages in the removal of the channel flakes and three forms of base on Folsom points.

factory and a second try was made. Major Coffin has two flakes in his collection which show this clearly. The first one was rather short and very thin, the second thicker and much longer. The first fits perfectly into the groove in the second.

After the fluting was accomplished, the edges and base of the point were refined by secondary chipping. This is evidenced by the fact that those broken in the grooving process, and consequently not completed, do not have the retouch. Occasional specimens show an additional treatment in that the base and the edges for about one-third of the length of the blade were smoothed. Whether this was intentional or accidental is not known. This smoothness may have resulted from the hafting of the stone in a wooden or bone handle, or, as one writer has suggested, it may be due to a deliberate dulling of the edges to pre-

vent the cutting of the lashings used to fasten it to the shaft.[28] This feature is present on only a small proportion of the true Folsom points but is common on the generalized eastern forms. On an occasional specimen, one-third to one-half the length of the blade above the base, is a small notch in each edge. These probably were to facilitate the fastening of the point to a shaft.

The extent to which the base was subjected to the final retouching process determined the contour of the concavity—whether it was curved, figure 3, *d;* wavy, figure 3, *e;* or squarish, figure 3, *f*. In most of the specimens from the Lindenmeier site it is wavy, because the bulk of the material was broken and discarded before completion, but there are some which show entire obliteration of all traces of the flaker "seat." In his distributional and typological studies on Folsom points Renaud worked out the percentages of base types and found that the curved concavity predominated, although the squarish and wavy forms were a close second.[29] He describes the latter as separate base types, C-1 and C-2, but groups them together as C in his tables, so that it is not possible to determine the number of each. Since the squarish or C-1 form on the basis of typology is the most highly developed and represents the ultimate stage in the perfection of the technique, percentages might be significant. A site with a predominance of the C-1 forms could be regarded as representing a higher cultural level than one where the C-2 was the main form.

Most of the point specimens from the Lindenmeier site are fragmentary, and all but a few of the pieces are butt ends. The scarcity of tips was puzzling at first. Consideration of the problem led to the conclusion that the prevalance of basal portions was due to one factor, the replacing of damaged points. Because of their brittleness, many were no doubt broken by hunters in the chase—snapped off in the killing of game. The shafts of the spears or arrows, unharmed and still serviceable, were carried back to camp and fitted with new points, the broken pieces being tossed into the midden. The fragment remaining in the shaft would naturally be the butt end; hence the numbers in the deposit material. It may be mentioned in passing that there is nothing to indicate whether the points were used in arrows or spears. Present thought is that the bow and arrow was a late development in the New World and that the older cultures employed a spear and spear thrower. Without evidence in the matter, archeologists concerned with the Folsom problem have gone on the assumption that the points were used in a shaft hurled from a spear thrower.

[28] Renaud, 1934 b, p. 3.
[29] Renaud, 1934 b, pp. 8, 9.

Measurements for the size range of points in the present collection are unsatisfactory because of their fragmentary nature. In his tabulations on specimens studied in numerous collections, including both the generalized and the true Folsom types, Renaud has compiled the following figures: Length, 17 to 115 mm; width, 14 to 36 mm; thickness, 3 to 14 mm.[30] For the true forms the range is not as great: length, 17 to 75 mm, with a 45.41 mm average; width, 14 to 32.5 mm, with a 21.94 mm average; thickness, 3 to 6 mm, with a 5.38 mm average.

SCRAPERS

A large proportion of the specimens in the collection belongs to the scraper group. There are several varieties of this type of implement, and the tools exhibit different degrees of workmanship. Some have as minute and careful chipping as that to be seen on the finest projectile points, whereas others are extremely crude and rough, only the minimum of effort necessary to make a usable implement having been expended on them. Most of the scrapers belong to the curved-end type, the so-called "thumb-nail" or "snub-nosed" form (pl. 9). Next in order, from a numerical standpoint, are the side scrapers. In this group are tools with straight, convex, and concave scraping edges. There are some turtleback scrapers and a few implements difficult to classify because they combine several features.

The "snub-nosed" type has a number of different subforms, but all are characterized by one convex, carefully chipped end. The treatment of the other end and the edges, as well as of the lateral surfaces, varies. To make such an implement, a flake of stone roughly the shape of a trigonal pyramid was struck off from a larger core. For the simpler form of the tool this flake was chipped along the base to produce the typical, thick, rounded end. The cutting edge then received an additional chipping which made it very sharp (pl. 10, *a, b, c*). The other end was left untouched, the bulb of percussion caused by the blow when the flake was detached furnishing a satisfactory tip. The side edges were not chipped, nor was anything done to the faces or lateral surfaces. This form is triangular in cross-section. A second subform was similar to the first except that the side edges were worked. A still more refined implement, the third subform, was made by removing the ridge or top edge so that the cross-section became pentagonal instead of triangular. Some additional minor retouching on the lateral surfaces occasionally accompanied this feature. The

[30] Renaud, 1934 b, pp. 9-10.

two side edges were also chipped. The removal of several long flakes from the top produced a fourth subform, one with a quadrangular cross-section. The latter also resulted from the removal of a single, long, broad flake, which produced a fluting similar to that on the projectile points. On practically all of the pentagonal and quadrangular forms the smaller end, as well as both edges, was modified by additional chipping. Rarely was the ventral surface, the bottom of the tool and the side which came off the core, altered in any way.

A very elaborate classification could be made for the subforms of this type of scraper by segregating the different specimens according to the various combinations of features. For the purposes of this paper that is not essential, but in a more detailed study such a subdivision would be advisable, especially when the subject of comparisons is considered. The "snub-nosed" scraper was not peculiar to this horizon or locality. Forms of it are found on recent Indian sites in the general High Plains area and elsewhere throughout the country. By means of an elaborate typological grouping it may be possible to point out distinctions, to determine criteria for identifying early and late forms. Such an attempt will be deferred, however, until a larger series from the Lindenmeier site is available. The "snub-nosed" scrapers from this site vary in length from 21 to 25 mm, in breadth at the cutting edge from 25 to 30 mm and in thickness from 4.5 to 11 mm.

The side scrapers exhibit considerable range in quality, degree of finish, and the types of flakes used in their manufacture. Some are light in weight and paperlike in their thinness. Others are thick and heavy. Certain examples display careful dressing of the faces of the blade as well as minute and precise chipping along the edges (pl. 11). There are other specimens that are little more than rough flakes with chipping along one edge or only on a portion of the edge (pl. 12). In some cases part of the siliceous crust or outer covering of the nodule from which the flake was struck is still present. The purposes for which the tool was intended no doubt governed the amount of work expended in its shaping. As will be noted from the illustrations, several of the implements combine both the convex and concave blades on a single tool (pl. 11, *g*). Others have one straight edge and one convex (pl. 15, *n*), or a straight and concave combination. The carefully worked side scrapers range from 30 to 62 mm in length, 15 to 33 mm in width, and 2 to 4 mm in thickness. The rough-flake forms vary from 40 to 60 mm in length, 20 to 45 mm in width, and 7 to 12 mm in thickness.

The turtleback is an interesting form of scraper (pl. 15, *i, j*). In the strict sense of the word these objects are not true turtlebacks, inasmuch as they are faceted on only one side, the other being flat or slightly concave. This feature can be attributed to the fact that they were made from large, thick flakes rather than from complete nodules; consequently, it was necessary to shape them on only one side. The convex surface of such tools is characterized by large facets suggestive of the back of a turtle. The edges exhibit the fine retouch typical of most of the specimens of the entire complex. If it was not for the latter feature, many of the turtlebacks might be considered as discarded cores from which flakes had been removed to be used in making small implements. Or they might even be classed as blanks waiting the specialization which would make them tools. Specimen *i*, plate 15, has a length of 53.5 mm, a width of 49 mm, and a thickness of 18 mm. The measurements for *j*, plate 15, are: length 57.5 mm, breadth 41.5 mm, and thickness 14 mm.

There is no definite knowledge about the uses to which the side scrapers and turtlebacks were put, but their functions were no doubt manifold. They could have served for dressing hides, for removing flesh from bones, for cutting bones, for smoothing spear and arrow shafts. In short, they combine in one implement the qualities of a knife, an adze, a gouge, and an abrading or finishing tool. The scraper in its various forms was indispensable in the daily life of the later Indians, and this was no doubt true for the dwellers at the Lindenmeier site. The general character of the different kinds of scrapers is well illustrated by the examples shown in the photographs; hence, more detailed descriptions of their various peculiarities are not necessary at this time.

BEVEL-EDGED TOOLS

The implements of the bevel-edged type are generally triangular in outline with a small, rounded tip and two chipped edges. The base is smooth and the faces comparatively flat. These tools might well be considered as points, although not in the sense of projectile heads (pl. 11, *b*). Their characteristic feature is the beveled edges. In making such a tool the chipping was all done from one side so that the cutting edge slanted obliquely to the opposite face. The stone was then turned over and the operation repeated. This produced an implement rhomboidal in cross-section, the faces constituting the width and the edges or short sides the thickness of the blade. When viewed with the point directed upward, the beveling is usually toward the left;

only a rare, sporadic example shows the reverse, with the chipping sloping away to the right. Perhaps this constitutes a record of right- and left-handedness in the group which made and used them. A few specimens in the collection do not correspond to the general pointed type, but have broad, unworked ends. Their sides, however, are beveled in characteristic fashion. The beveled edge is not confined to tools of this type; it occurs, singly, on some of the side scrapers. Perhaps the beveled points should only be considered as broken tips from knife blades. Yet basal portions have not come to light, and it would seem that the implements found represent the complete tool. They would serve well in the capacity of a knife, particularly in the skinning of an animal, where the cutting motion was toward the user. Those with the broad, unchipped ends would not do for such a purpose and must have been employed as a variety of scraper. The triangular examples could also be used as reamers in enlarging holes started with a small punch or borer.

The bevel-edged tools in this collection are not unique for North America, but it is interesting to note that the form occurred in the Folsom horizon. Henry B. Collins, Jr., has examples that he found in Alaska.[31] Kidder obtained a number of knife blades in his work at Pecos which exhibit the feature.[32] There are examples from late Plains sites, and they are fairly numerous in certain districts in Ohio, Alabama, Tennessee, and Georgia.[33] These forms are more definite in their shaping, however, and are presumably of a much later date.

The triangular forms of the bevel-edged tool found at the Lindenmeier site range from 25 to 30 mm in length, 26 to 32 mm in width, and 4 to 6 mm in thickness. The flat-ended forms are from 27 to 40 mm in length, 29 to 33 mm in width, and from 6 to 8 mm in thickness.

GRAVERS

The tools given the designation "gravers" constitute one of the most interesting groups in the whole collection (pl. 13). This is due not so much to the actual nature of the specimens themselves as to their indication that some form of the engraver's art was practiced by the makers of the Folsom points. No objects exhibiting such handiwork were found, but the character of the implements suggests that further work may uncover pieces of bone or other material, similarly resistant to the agents of decay, upon which designs were scratched.

[31] Collins, 1931, 1932.

[32] Kidder, 1932, pp. 30-34.

[33] Fowke, 1896, pp. 160-161, 177-178. Wilson, 1899, pp. 931-934.

The later Indian tribes employed the engraver's art extensively, although it never reached a high degree of excellence north of Mexico, and it is not unreasonable to suppose that it was one of the cultural features in earlier periods. Other peoples in comparable stages of development are known to have responded to the creative urge by drawing with stone on bone, and it is not assuming too much to concede the ability for delineation to such skilled chippers of "flint" as the Lindenmeier group, particularly since there was so abundant a supply of stone and bone ready at hand.

The simplest and most numerous gravers consist of fortuitous flakes which were modified only to the extent of chipping a small, sharp point on one side or end (pl. 13, *a-g*). These short, needlelike points are superficially similar to those commonly classed as drills or borers. They differ, however, in that one face is flat, while the other has beveled edges and a chisellike tip. The usual drill points are chipped on all sides. Furthermore, on several of the present examples small, almost microscopic, flakes have been broken away from the point. The appearance of this feature is such as to suggest that it was caused by a scratching or gouging movement of the implement rather than by a rotary twist such as is used in drilling. On only one of the tools in this group is the point long enough to have functioned as an awl. A hole could be punched through a thin hide with it, but its shape is not adapted to even the slight twisting motion ordinarily accompanying such a procedure. The gravers in this group are from 20 to 44 mm long, 18 to 28 mm wide, and 2.5 to 3 mm thick. The points are consistently from 1.5 to 2 mm long and 1 to 1.5 mm wide at the base.

Some of the gravers are more definitely shaped than the scrap-flake series just described. (See pl. 13, *h-j*.) They were also made from flakes, but the points are broader, more elongated, have a definite bevel on the tip, and exhibit superior workmanship. The chipping is not confined to the actual point but extends along the edges. The finest specimen in this group is *j*, plate 13. The tool was made from a flake, but the entire stone was chipped to obtain the desired shape for the implement. Both faces, the lateral surfaces, and the ends received careful attention from the maker. In addition there is a fine marginal retouch along two edges and around the narrow end. The tip of the latter has a pronounced bevel. The entire object is suggestive of modern tools used in lathe work. Perhaps this particular implement should be classed as a chisel rather than a graver, yet it would have functioned well in the latter capacity. As a matter of fact, there is a certain over-lapping of meaning in the terms "chisel" and "graver,"

and in the present preliminary classification fine distinctions are not essential. The more definitely shaped gravers are from 32 to 38 mm long, 16 to 29 mm wide, and 5 to 9 mm thick. The points are from 9 to 10 mm long.

Several combination tools were found (pl. 13, *k-m*). These incorporate the qualities of the scraper and the graver in a single implement. One typical "snub-nosed" scraper (pl. 13, *k*) has a small sharp-tipped graver point at one end of the convex scraper edge. There is a second graver midway along one lateral edge. With these two points the implement could have functioned as an instrument for drawing parallel lines or for making circles. The point at the end of the tool could have been used for any purpose that the single, simple gravers served. The opposite lateral edge is a good concave side-scraper. With a tool of this type the artisan could perform a number of operations without changing implements. This specimen has a length of 38 mm, breadth of 28 mm, and a thickness of 6.5 mm. The graver points are 2 and 1 mm long and 2 and 1.5 mm broad at the base.

The two specimens *l* and *m*, plate 13, are combination gravers and sidescrapers. The scraper features are concave and convex. One of the artifacts has two graver points, in this case on opposite sides, whereas the other has only one. The latter, however, is one of the most precisely chipped points in the entire collection. These implements are 39 and 42 mm long, 22 and 22.5 mm wide, 3.5 and 4.5 mm thick. The single point on the one is 2.5 mm long and 1.5 mm broad at the base. The points on the other are 1.5 and 2 mm long and 1 mm wide at their bases.

KNIVES

There are a number of specimens which may be classed under the heading of knives. The best examples are carefully chipped blades which exhibit typical Folsom characteristics in their fluted faces and the marginal retouch along the edges. Their ends, however, are rounded, and the sides tend to be parallel rather than bulging or tapering as in the case of the points (pl. 7, *m, n*). The complete specimen is 51 mm long, 23 mm wide, and 4 mm thick. The broken one is 25 mm wide and 3 mm thick.

The channel flakes from typical Folsom points were not always discarded. Several examples show that they were used as knives. Close inspection of the edges reveals minute retouching, which perfected the cutting qualities of the stone and made a serviceable tool from one of the by-products of the process of point manufacture.

There is extreme variation in the length of these objects. This may be attributed to their thinness and liability to breakage. Specimens range from 23 to 46 mm in length, 13 to 17 mm in width, and 1.5 to 2 mm in thickness.

A crude, yet efficient implement was the flakeknife (pl. 14, *a-e*). Tools of this type were made from large, ribbonlike fragments of stone modified only to the extent of chipping along the edges. On some of these implements the chipping is large and irregular. On others it is as minute and precise as could be desired. Both concave and convex edges are present in the series, occuring either singly or in combination on the same implement. Study of such flakes suggests that they were first employed as struck off the nodule, the razor-keen edge of the stone being ideal for cutting purposes. Then as the edge became nicked and dulled through use, it was touched up with the flaking tool until, eventually, the whole edge was chipped. Because of their rough, unfinished nature, implements of this type have received scant notice in American archeology and, if mentioned at all, have frequently been dismissed with the explanation that they were rejects, scrap "flints" tossed aside because they were not good enough to work into finished tools. This certainly was not true of the present group, as the objects obviously are implements. They would readily function for cutting chunks of meat for the stew-pot or even for the skinning of an animal. The length of the specimens in this group varies from 49 mm to 88 mm, the breadth from 15 to 36 mm, and the thickness from 4.5 to 10 mm.

A second group of flakeknives consists of a border-line series of larger implements which could serve either as knives or scrapers and which could be included in one or the other category with equal justification (pl. 14, *f-n*). The main reason for listing them as knives is that most of them have a peculiar twist to the flake which makes them more adaptable for cutting purposes than for scraping. These implements, as mentioned also in the discussion of other types, no doubt served a variety of purposes, and a hard and fast classification of the form is out of the question. The group ranges in length from 53 to 111 mm, in breadth from 38 to 74 mm, and in thickness from 8 to 10 mm.

BLADES AND CHOPPERS

Included in the collection are leaf-shaped blades and several large points which appear to be ends broken from such blades (pl. 15, *a-h, k*). The blades are reminiscent of the so-called blanks which represent the intermediate stage between the original nodule and the

completed implements. Ordinarily, among the later Indians, the specialization of the blanks was not undertaken at the quarry where they were roughed out. Instead they were taken home and then perfected as time permitted. At the Lindenmeier site, however, the process was probably carried through from start to finish on the spot because the material was right at hand. The present specimens are not true blanks despite their close resemblance to those forms. They are actual implements. This is shown by the careful secondary chipping along the edges. Such blades may be considered as combination knives and scrapers. Whether the broken ends should simply be regarded as such or whether they should be classed as scrapers is a difficult question to answer. Primarily they are portions from larger blades, but they also served as implements in their present state. The smooth-fractured surfaces on the ends of several examples have minute facets, the result of chipping along their edges. In some cases this appears to be the result of use. On others the removal of the tiny flakes was unquestionably intentional. Points of this type, although only a portion of the original tool, would be serviceable as knives or scrapers. The ends are from 32.5 to 50 mm long, 39 to 48 mm wide at the base, and 7.5 to 9 mm thick. The blades measure 52 to 88 mm in length, 28 to 41 mm in width, and 7.5 to 10 mm in thickness.

The class of implements tentatively called choppers might well be considered variations of tools generally known as hand axes and rough celts (pl. 15, *l*, *n*). Because they do not answer in many respects to the usual definitions of such tools and since they obviously were for the same purpose, despite their difference in form, it is thought less confusing to group them together under the designation of choppers. Such tools would have been efficient in splitting and hacking bones. That some such implement was employed is indicated by the bone fragments. One of the examples pictured (pl. 15, *l*) was made from a chalcedony nodule and is one of the few true "core" specimens found at the site. It must have been made definitely for this purpose, as the flakes removed in shaping it were not large enough to have served in the manufacture of other tools. Although the main chipping is large, there is a fine retouch on portions of the edges. The broad end of the tool is well adapted for grasping, and the smooth, flat base would protect the palm of the hand from injury. This implement is 86 mm long, 61 mm broad, and 15 mm thick. The second specimen (pl. 15, *m*) is a pseudo-core; it is the core of a large flake, not that of a complete nodule. In its general shape it strongly suggests the

adze or celt of the later Indians. The workmanship is cruder, however and although it may be an example of the prototype of such tools, it will be considered here as a chopper. Little effort was expended on this implement. The chipping is confined to the one chisel-like end. The base is rough, some of the edges being sharp enough to cut the palm of the hand holding it. It would need to be wrapped in a piece of buckskin or a similar substance to prevent slipping and for the comfort of the user. The stone is 74 mm long, 40 mm broad, and 21 mm thick. There are no marks on either of these specimens to indicate that they might have been hafted in some kind of handle.

MISCELLANEOUS OBJECTS

The pieces of sandstone in the collection cannot be assigned to any definite class of implements, yet all show signs of use. There is no material of this nature in the immediate neighborhood, and the stones must have been carried in for a particular purpose. Two of them, although irregular in form, have a slight groove along one side. The surface of the stone in the grooves is rubbed as though the objects might have served as shaft polishers (pl. 16, *a, b*). They are not typical of the implements generally called shaft polishers, however. One stone is flat, roughly oval in outline, and has a shallow concavity in one face (pl. 16, *c*). Traces of red pigment still adhering to the stone suggests that it functioned as a pigment bowl. It does not seem likely that this was a mortar for grinding paint, as it shows no effects of a pestle. It was merely a palette. One irregularly shaped stone has a smooth surface on one side, which indicates that it served as a rubbing stone (pl. 16, *e*). Another was shaped, but there is nothing to suggest what its purpose may have been (pl. 16, *d*). One example is flat with one curved edge. The specimen obviously is not complete, and it may be the remaining portion of a lid or cover for some container. The curved outer edge has a series of facets where flakes were knocked off in the shaping process (pl. 16, *f*). The material is soft and could easily have been ground into the desired form but, in accord with the prevailing technique of the horizon, the flaking process was employed.

A number of pieces of hematite were recovered from the deposits. The surfaces of all of them are smooth and striated from rubbing. This is a good indication that they supplied pigment material, a factor which correlates with the presence of the sandstone object suggestive of a pigment bowl. Hematite in its various forms was extensively used by the later Indians for making implements, ornaments, and

small objects whose purpose is unknown. It also served as a source for paint, the compact red, earthy varieties known as red chalk and the pulverulent red ocher being especially popular for this purpose. Powdered hematite was mixed with grease or saliva and then applied to the object to be painted. It was used for facial decoration, for coloring skins and hides, for painting spears, arrows, shields, skin tents, and other objects which the Indian desired to embellish. The finding of the material at the Lindenmeier site is good evidence that the makers of the Folsom points were also users of red paint. None of the fragments indicate that they were shaped to serve as ornaments, nor are they of the problematical object type.

Several nodules with battered ends were found, and there is one flat stone of granite, roughly circular in outline but with one flattened edge, which is broken away along one side as though from blows. These objects no doubt served as hammers. They could be employed in knocking flakes off large nodules, for cracking bones, and in other capacities where a striking implement would be required. The flat granite specimen has one convex, smooth side, which suggests that it also may have served as a rubbing stone (pl. 16, *g*).

There are a number of bones in the collection which, although they are only chance scraps, indicate that they could have served as tools. Each of these objects has a tapering, blunt-pointed end which shows some signs of wear. They may have functioned as punches or awls, but because they are not definitely prepared implements and do not exhibit pronounced signs of usage, they will be regarded only as fortuitous tools at this time. When more evidence is available, it may develop that split bones with such ends actually should be classed as a type of implement. For the present, definite conclusions will be held in abeyance.

IDENTIFICATION OF BONES

Owing to the scrappy nature of most of the bone material recovered, it has not been possible to identify all of the animals represented. Some of the fragments are from small mammals, but most of them are bison. Part of the latter material, portions of jaws and a good series of teeth, was referred to Director J. D. Figgins, of the Colorado Museum of Natural History, who has made a specialty of the study of bison remains. He reports that the bison found at the original Folsom site, *Stelabison occidentalis taylori* and *Bison oliverhayi*,[34] are

[34] Figgins, 1933 b.

represented in the material from the Lindenmeier site. In this connection he wrote:

> There was no trouble identifying the material not too badly damaged. We have the types of all the bison we have described, in addition to many jaws and separate teeth, so that it was merely a matter of comparison and measurement. You may be assured of the accuracy of the identifications, as your specimens check, in every respect, with our Folsom, New Mexico, types. I entertain no slightest doubt that your material is typical of the two Folsom races.[55]

The occurrence of the same species of bison at the two sites is of particular interest and serves to tie them to the same general horizon. The full significance of the material, however, is still to be determined. The bison with which the Folsom artifacts are associated were larger than the modern species and had more massive, less sharply curved horns.

Other bones, identified by Dr. Remington Kellogg, assistant curator, division of mammals, United States National Museum, are from the fox (*Vulpes velox*), the wolf (*Canis nubiltus*), and the rabbit (*Lepus townsendii campanius*). Unfortunately, none of these throws any light on the question of the age of the site, as it is not possible to differentiate between the Pleistocene and present-day forms. It is interesting, though, to have this addition to the fauna of the Folsom horizon.

SUMMARY

At the Lindenmeier site in northern Colorado is the first occupation level yet found which can be definitely correlated with the makers of the now well-known Folsom points. Distinct traces of a former campsite and workshop are present at this location. Midden deposits have yielded a series of implements actually associated in situ with typical Folsom points. Similar tools have been found at various surface sites, but this is the first evidence to demonstrate that they belonged to the Folsom complex. In addition to the assortment of artifacts, there are flakes, spalls, and nodules, indicating that the implements were made on the spot. Furthermore, this chipper's debris gives good clues to some of the methods used in shaping the tools. The artifacts in the collection show that the lithic component in the local culture pattern was primarily a flake industry, only a few implements of the core type being found. Cut, broken, and split animal bones from the deposits have been identified as being from bison, fox, wolf, and rabbit. The bison remains indicate that those animals belonged to the same extinct species as those found at the original Folsom quarry. This is a significant link between the two sites.

[55] Letter from Mr. Figgins to the writer, Feb. 28, 1935.

Smithsonian Miscellaneous Collections
Vol. 94, No. 4

A FOLSOM COMPLEX

Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado

By FRANK H. H. ROBERTS, JR.

ERRATA

On page 32, paragraph 3, lines 3 and 4 should read as follows:

the fox (*Vulpes velox*), the wolf (*Canis nubilus*), and the rabbit (*Lepus townsendii campanius*). Unfortunately, none of these throws

. . . . .

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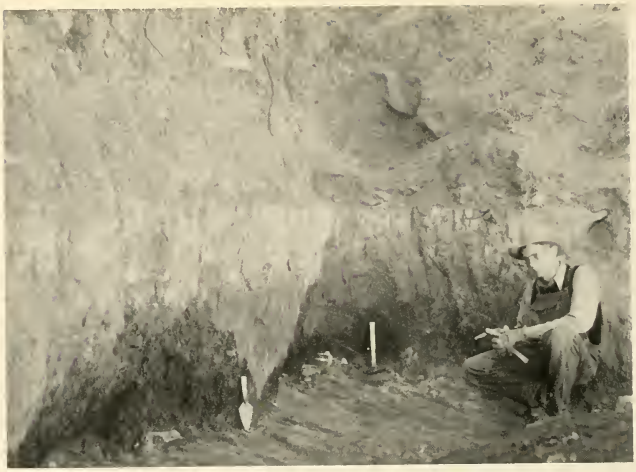
1. RAVINE IN WHICH MAIN DEPOSIT WAS FOUND

2. DEEP PIT AT THE BEGINNING OF INVESTIGATIONS
Man is standing on level where material was obtained.

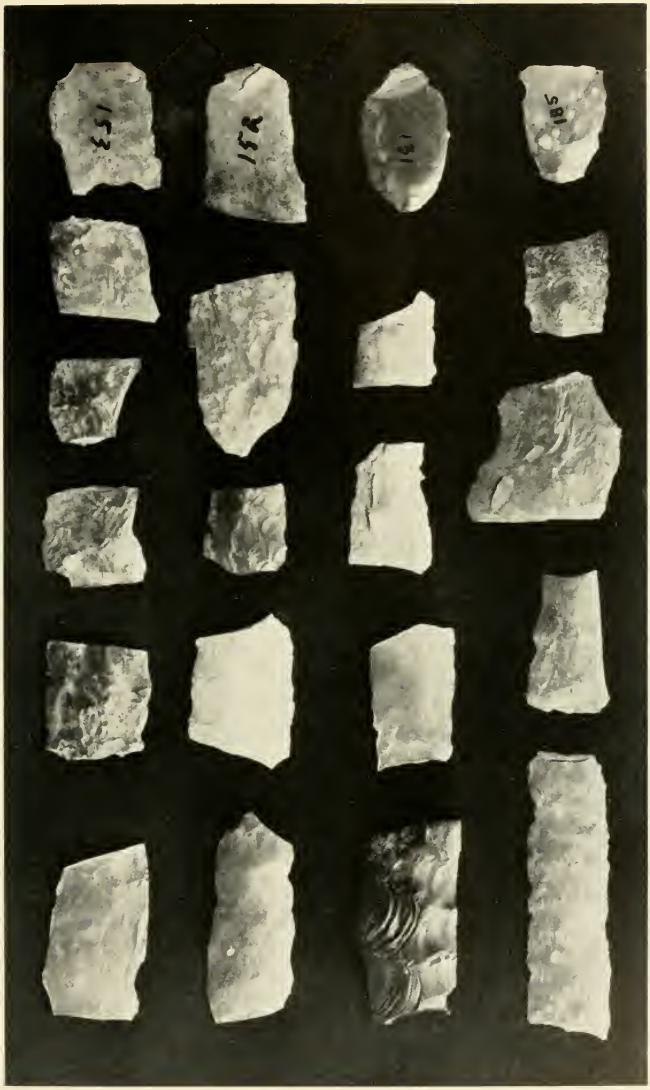


1. SOIL LAYER IN WHICH SPECIMENS OCCUR

Bones are resting on top of Oligocene bed. A. L. Coffin at right of picture.

2. BONES AND "FLINT" IN SITU IN DEPOSIT

Arrow points to implement.

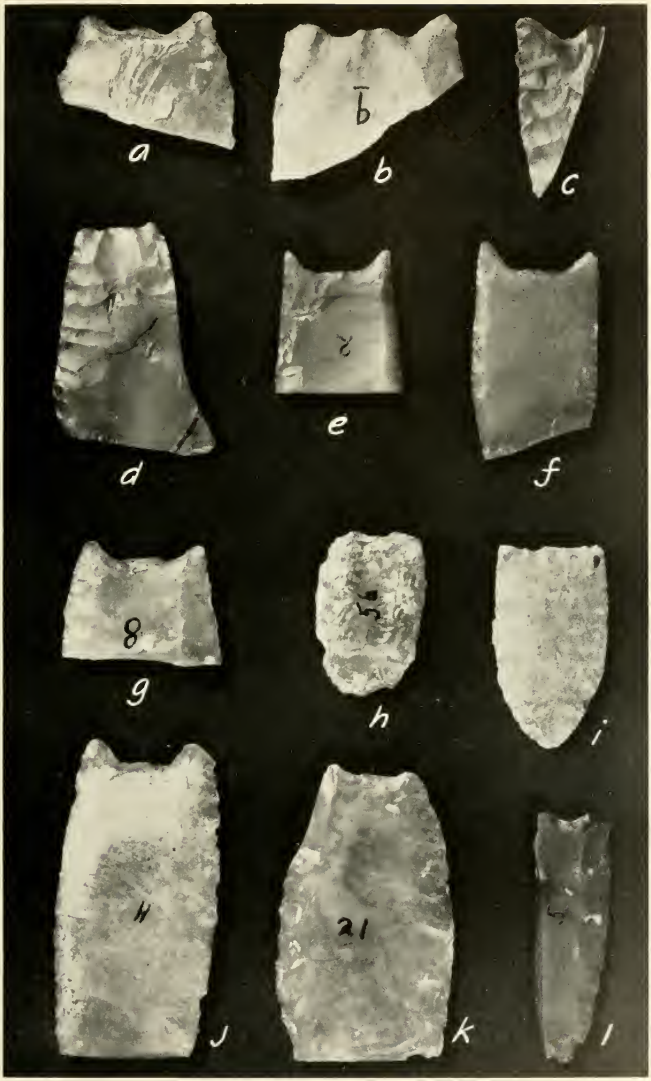


CHANNEL FLAKES FROM FOLSOM POINTS

Actual size.

PORTIONS OF FOLSOM POINTS

Actual size.



REVERSE OF POINTS SHOWN IN PLATE 5

Actual size.

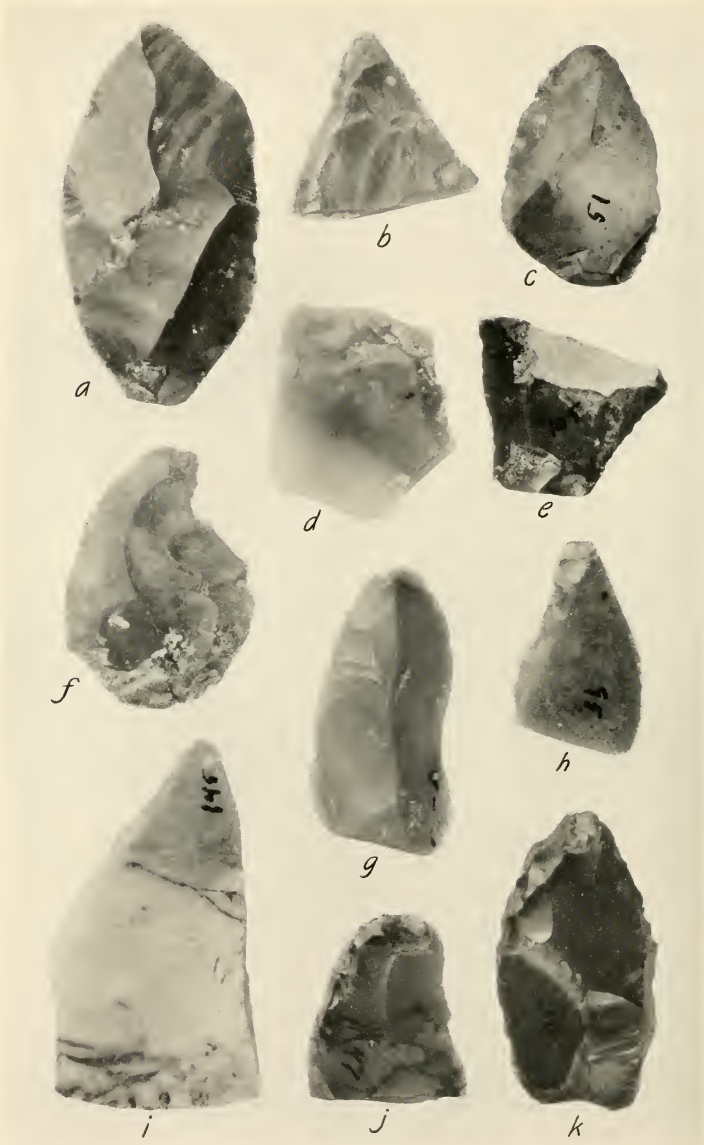
FRAGMENTS FROM FOLSOM POINTS AND KNIVES
Actual size.

REVERSE OF POINTS AND KNIVES SHOWN IN PLATE 7

Actual size.

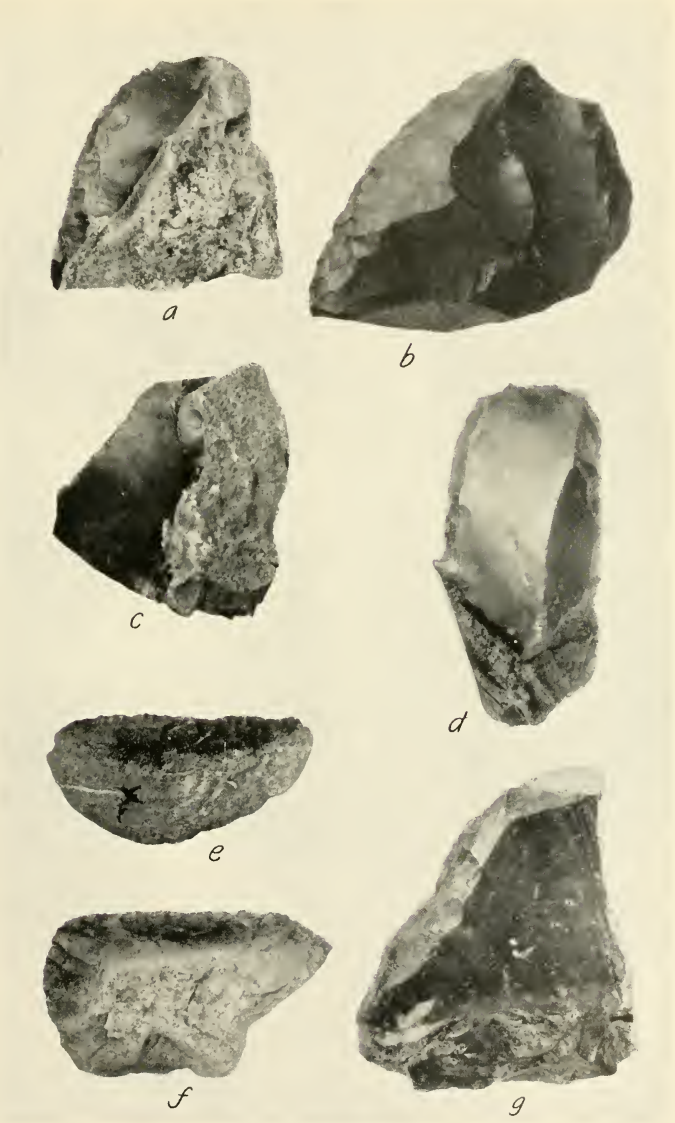
"SNUB-NOSED" SCRAPERS
Actual size.

END, SIDE, AND BACK VIEWS OF "SNUB-NOSED" SCRAPERS
Actual size.



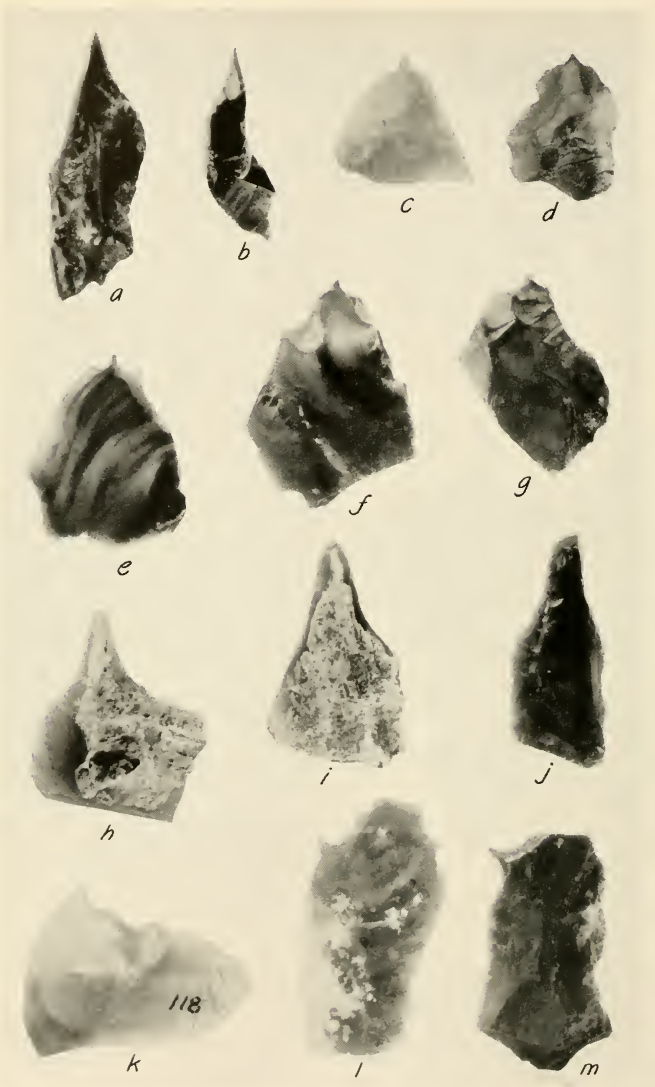
SIDE SCRAPERS

Actual size.

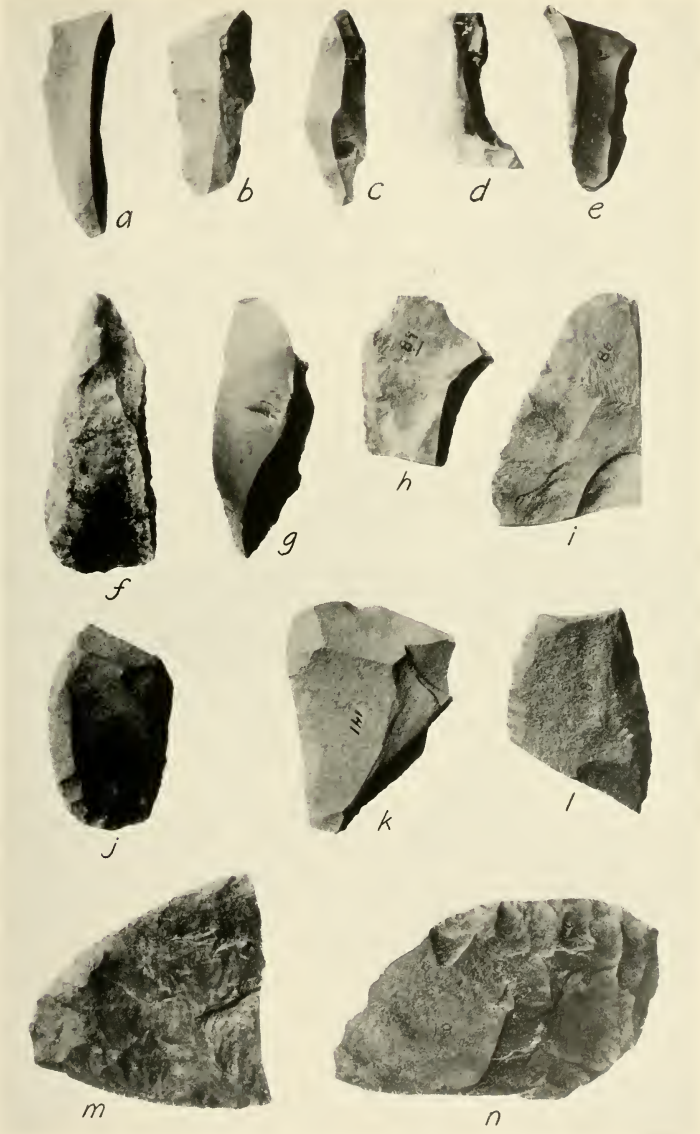


ROUGH-FLAKE SCRAPERS

Actual size.



GRAVERS
Actual size.

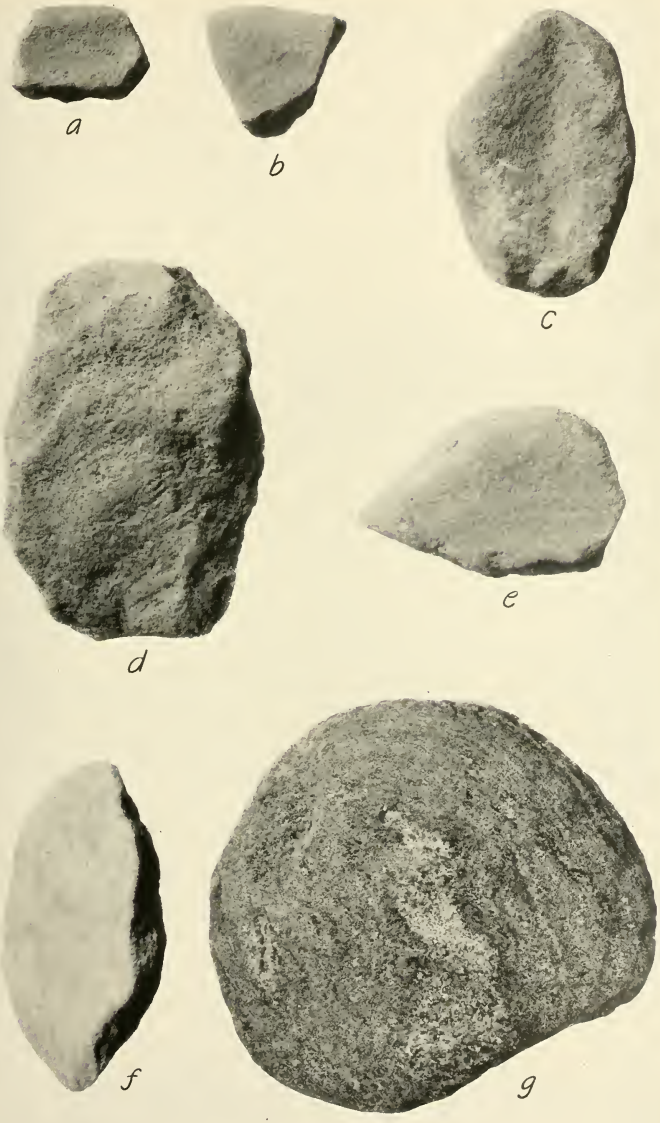


ROUGH-FLAKE KNIVES

One-half size.

BLADES, POINTS, TURTLEBACKS, AND CHOPPERS

One-half size.



SANDSTONE OBJECTS AND GRANITE RUBBING STONE
One-half size.