

PRESERVATION OF SKELETONS

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During the excavations conducted by Phillips Andover Academy at the ruins of the Pecos Pueblo, about thirty miles southeast of Santa Fe, New Mexico, some six hundred skeletons were uncovered and preserved. A development of a method for handling skeletons in the field resulted. Altho the method here described is only applicable under similar natural conditions, it is offered for record as an example of the manner in which one archaeological expedition handled a large number of skeletons.

The Pecos Indians used the rubbish heaps of the village (most of which are on the eastern side of the low mesa) as their cemeteries. The natural deposit surrounding the pueblo is a hard red clay, a much more difficult substance to dig in than the comparatively loose earth of the rubbish heaps. The few grave shafts which were identified showed that the burials were usually made in pits just large enough to receive the bundled body, and only one and a half to two feet deep. Since, however, the rubbish heaps were continually increased by small daily increments, those skeletons buried in shallow graves during the early periods of the occupation of the site, became more and more deeply covered until some of them were under as much as twenty-two feet of earth. A column of earth of twenty feet or so exerts an enormous pressure, which was clearly recorded by the crushed condition of the bones and burial furniture in some of the early burials. The bones were, however, usually dry, and well-preserved from all other destroying agencies, requiring, therefore, practically no application of paraffin or other preservative upon excavation.¹

The relatively small surface of the rubbish heaps in proportion to the population and length of occupancy of the site (nearly the entire

¹ For treatment of bones in bad condition see Hrdlička, A., Directions for collecting information and specimens for physical anthropology. *Bull. U. S. Nat. Mus.*, Part R, No. 39, Wash., 1904, pp. 12-13.

range of pueblo history in the Rio Grande valley), resulted in a superabundance of skeletal material in most of the trenches run through the heaps. An examination of the maps of the work showed that, horizontally speaking, skeletons were found most frequently in certain ill-defined zones. The burials were distributed vertically as well as horizontally. The congestion at times was so great that both horizontal maps and vertical sections on large scales were required in order to record the locations of the individual burials. Several times as many as twenty skeletons were exposed in the course of one day's work in one of the deeper rubbish trenches. The greatest congestion occurred in a column of rubbish twenty-five feet long, five feet wide, and twelve feet deep, in which thirty-four burials were found. This means an average of one in every forty-four cubic feet, i. e., a column of earth approximately four feet long, two feet wide, and six feet deep. The fact that these burials were made at different periods, and with practically no disturbance of those which antedated them emphasized the evidence regarding shallow graves.

EXCAVATION AND REMOVAL

Skeletons were found under nearly every possible condition. Usually the men working on the face of a trench exposed some one bone or group of bones, such as toes, fingers, one end of a humerus or femur, or the skull. Occasionally an unavoidable accident was caused by the entry of a pick into a cranium, the presence of which was entirely unsuspected.

Digging stopped at once in the immediate vicinity of the exposure. An examination of the visible bones was made in order that the position of the skeleton might be determined before any work was done. Experience familiarizes one with possible positions so that as a rule it is an easy matter to determine where the bones probably lie. The normal position in this locality was fully flexed, on the face, or on either side, but semi-flexed postures did occur. During the late period a few burials were at full length, either on the face or on the back, with the feet crossed. Occasionally unusual positions caused much confusion.

After the probable position of the skeleton was determined the cleaning for study and record began. It was found that some of the better workmen could be trained in a short time to clean skeletons in an entirely satisfactory manner. The primary purpose of this cleaning was to expose to view just enough of the bones to make clear their position. If a photograph was to be taken the cleaning was more thorough. The

location of the burial with respect to the excavations controlled to some extent the preliminary work.

The first step in cleaning was to remove all earth more than four or five inches above the skeleton with a hand pick and shovel. Occasionally a skeleton was exposed near the base of the face of a deep trench. It had to be re-covered until the trench work reached such a point that the bones could be easily cleaned. In some cases a small cave was dug in the side of the trench in such a manner that the burial lay on the floor of it.

When the mass of earth over the skeleton was removed the more delicate work of actually cleaning the bones was done with a jack-knife and fine brush. Two general rules insured good work. First nothing but earth was moved. The bones and accompanying furniture were brushed only. Secondly no object in the burial was undermined. Special cases occasionally demanded a departure from these principles. If it proved necessary to remove some of the accompanying objects, notes and drawings were taken during the process of removal. Occasionally the position of the bones required the undermining of some of the long bones in order that the position of the skeleton could be determined. This undermining was, however, as slight as possible and plenty of adequate support was left for the bones so treated.

After the position of the skeleton was clear notes were taken as soon as possible. In case many skeletons were being exposed, one individual did nothing but take notes on them until all were cared for. Best results were obtained by the use of a printed form, which made all the skeletal notes uniform and shortened the time of recording as well. The expedition used a form printed on a five by eight inch card (see figure). All skeletons were numbered serially in the order of their discovery, without regard to location, either vertically or horizontally. The sex and age were roughly determined, subject to more careful study in the laboratory. The condition of the bones in general was then noted, with a remark, if necessary, about any condition of special interest. The furniture found in the grave was listed, with notes in regard to its condition, position with respect to the bones, and its field catalogue number. The last was often not obtainable until later in the day, but it was a valuable check on the catalogue number of the specimen later. Under "remarks" any notes regarding the relation of the burial to its immediate surroundings were entered. The grave was then located with reference to the fifty foot square in which it

occurred. When a more accurate location was necessary, this was easily recorded in the same manner after measuring the coördinates of the position from the nearest survey stake. The depth from the surface and the height above the floor of the rubbish heap was important, since it located the grave stratigraphically. Sometimes conditions were such that the height above bottom could not be determined, in which case the depth was of still greater importance. The recording of the date found, and the initials of the cleaner and recorder completed the notes. Then a diagram of the position of the bones was made. The reverse of the card was blank, to be used for further notes.

If the skeleton was of special importance either because of its position or the material found with it, it was then photographed. When only a few skeletons occur at a given site, it is best to photograph all of them, but where hundreds are found, the conditions of burial are so often nearly identical that the accumulation of such quantities of photographs would be more of a hindrance than help. For a photograph the bones and furniture were brushed sufficiently to make them stand out against the dark background of the earth. It proved to be essential that the skeleton number be placed in the photograph in some manner, for identification later. A card with a pencilled number was entirely inadequate because it was either too small or the light struck it in such a manner that the number was not photographed. The best method is the use of a series of tin house numbers which can be stuck in the earth near the bones.

After the recording and photographing, the burial was removed. This was also done by trained workmen. Force was never used in removing any of the bones. Everything over a given bone was taken care of before it was moved. After the burial was apparently entirely removed, the earth about the skeleton was loosened and sifted through the fingers, searching for small potsherds, beads, toe and finger bones, and small skull fragments. Before actual removal was begun temporary receptacles in the form of heavy manila paper bags bearing marks of identification were placed at hand ready for use. The bones were put in one or two of these bags, and all the burial furniture, including potsherds and noteworthy stone and bone, in one or two more. The bags containing the bones bore the number of the skeleton and the number of bags used for it. This last number was invaluable at the time of assemblage for packing. A fraction was used, in which the numerator was the skeleton number, and the denominator the number

of bags in which the bones were put. This identification mark, in the upper right hand corner of one wide side, was large and clear, made with a soft pencil, so that it could be easily seen. On the bags containing the furniture a similar mark was used with the addition of the abbreviation "skel."

PACKING AND SHIPPING²

The skeletons in their temporary receptacles were stored each day on shelves in the building at the ruins. At irregular intervals during the field season the skeletons collected were packed. Congestion in the field storage rooms and unnecessary handling of bags were, of course, avoided as far as possible.

Bones are best packed in light material, but efficiency should not be sacrificed for weight. The containers may be either of wood or fibre. If a wooden box is used, it may serve later as a permanent storage case for the material in the museum. On the other hand fibre boxes or cartons are lighter and more easily transported when empty because of their collapsibility. Compo-board or beaver board cartons are more serviceable, because of greater strength, than those of corrugated cardboard. A container may be used with sides of wood, top and bottom of beaver board, and partitions of cardboard. The containers used at Pecos were of the corrugated carton type. It was found that these boxes did not keep their shape and were apt to be very weak if once wet, even when waterproofed. Handling in shipping seriously wrecked one or two of them.

The shipment boxes used held two complete adult skeletons. The dimensions given below proved entirely satisfactory for Indian skeletons, and have the added advantage of being more easily obtained from manufacturers than odd sizes. Each box was 24×18×9 inches, opening on its largest side. For two adult skeletons two partitions, one lengthwise and one crosswise, were used for each box, since each skull was in a compartment by itself. There was such a large percentage of fragmentary and immature skeletons that often many more than two were put in one box, necessitating one and a half to twice as many partitions of each size as there were boxes. In the shipment sent east as many as fifteen skeletons, all infants, were put in one box, in which four cross partitions and two lengthwise partitions were used. There is a great advantage in using partitions of cardboard, because of their adaptability to the needs of each specimen. An examination of the material

² See Hrdlička, A., *o. c.*, 13-14.

to be packed in one box gave the relative proportions needed in the different compartments. The necessary partitions were then cut so that they fitted together like the partitions of an egg-box.

The material in which the bones are packed within the box depends largely upon what is obtainable. The only requirement is that the bones do not rattle. The weight and lack of cohesion of sawdust practically prohibits its use. Paper has not sufficient elasticity. Shavings or shredded cedar bark should be satisfactory, but excelsior is probably the best packing material. Dried grasses or plants may be used where an expedition is unable to obtain manufactured material. At Pecos hay was used with some straw, the former being by far the more satisfactory. If the boxes are handled a great deal, the bones are apt to shake down through the hay.

The actual packing can be done most expeditiously and with least confusion if a definite system be adopted and followed. Four men working together gave the best results. Two men, seated one on each side of the box, did the actual packing. In front of each man was a clear space, either on the floor or a table, where the contents of the bag or bags which were to be packed, were put. At one end of the box was a pile of the packing material from which the packers drew their supply. The bones were packed in the box in layers, alternated with layers of the packing material. The skull was placed in the small compartment at one end of the box, surrounded by hay, after the necessary wrapping and binding of teeth and loose parts had been completed. When the skeleton was all packed the remaining earth was carefully examined for teeth and small bones, and then cleared away, leaving a clean area for the next specimen. This eliminated any opportunity for confusion of bones of different skeletons, and each packer handled only one specimen at a time. A third man assembled and prepared the skeletons for each box, and assisted in the sealing. The fourth man prepared the box and partitions for the packers and sealed the filled boxes. Since the boxes were collapsible both the top and bottom were sealed with gummed paper strips, at least three inches wide.

Great care was taken to insure proper means of identification of the packed material. A clearly marked slip was placed within each compartment of the box, and on one side of the box the numbers were written large with a crayon. A rough diagram of the compartments within was drawn on the top of the box, showing the number associated with each

The final step in packing was the crating of the boxes. A strong and compact crate was built of one-inch boards, four inches wide, which held sixteen boxes, making a total weight of about 350 pounds when shipped. These crates withstood the journey from New Mexico to Cambridge, but were badly smashed by the express man delivering them. A crate weighing not more than 200 pounds is better. Eight boxes to a crate gives the best results.

If cardboard boxes are used special precautions should be taken to protect the crates from the weather. The crate, in this case, should also be so constructed as to give the least possible opportunity for denting and tearing the cardboard by contact with other shipments.

Shipping facilities vary greatly with the location of the work. The ordinary freight rate for human bones buried more than forty years was three times first class in 1918, while the express rate was only first class. It proved to be a saving to send the entire shipment of two and a half tons by express to Cambridge, for by freight it cost more to Chicago alone. The six hundred odd skeletons filled, when crated, a surprisingly large amount of space, about half a freight car. Arrangements in regard to rates and space should be made in advance, securing a special rate and an extra car if possible.

In conclusion, then, the handling of skeletal material in the field³ is divided into two large divisions, the excavation and removal, and the packing and shipping. Each stage of the work raises detailed problems which must be solved by each expedition with due regard to the conditions under which the work is carried on.

No.—658

SEX—♀

AGE—Adult

CONDITION—Medium, skull crushed

POSITION—Flexed, on face, head south

LOCATION—1000/E 150

DEPTH FROM SURFACE—39"

HEIGHT ABOVE BOTTOM—43"

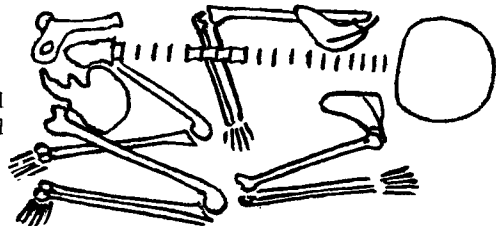
FOUND—7/12/16

CLEANED BY—M. V.

NOTED BY—C. E. G.

FURNITURE—Glaze 4 bowl inverted (#2127) close over hips

REMARKS—1 ft. below #653; white ash layer 6" below pelvis.



³ For the care of skeletons in the museum and laboratory see: Hrdlička, A., Arrangement and preservation of large collections of human bones for purposes of investigation. *Am. Naturalist*, 1900, XXXIV, 9-15; and Oettinger, B., Suggestions for cataloguing of anthropological material. *Am. Anthropol.*, 1916, XVIII, 398-410.