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OHIO'S PREHISTORIC "ENGINEERS"

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WE ARE generally inclined to think of the Indians as a people who possessed a rather simple culture and who apparently lacked the ability or knowledge to conceive and carry out projects which required detailed planning and cooperation. While it is true that they led a simple life as compared to our present complex civilization, the facts of history and archaeology indicate that certain groups or tribes were well organized and were able to plan and develop rather elaborate social and material structures. It is with the latter kind of structures that we are concerned in this paper.

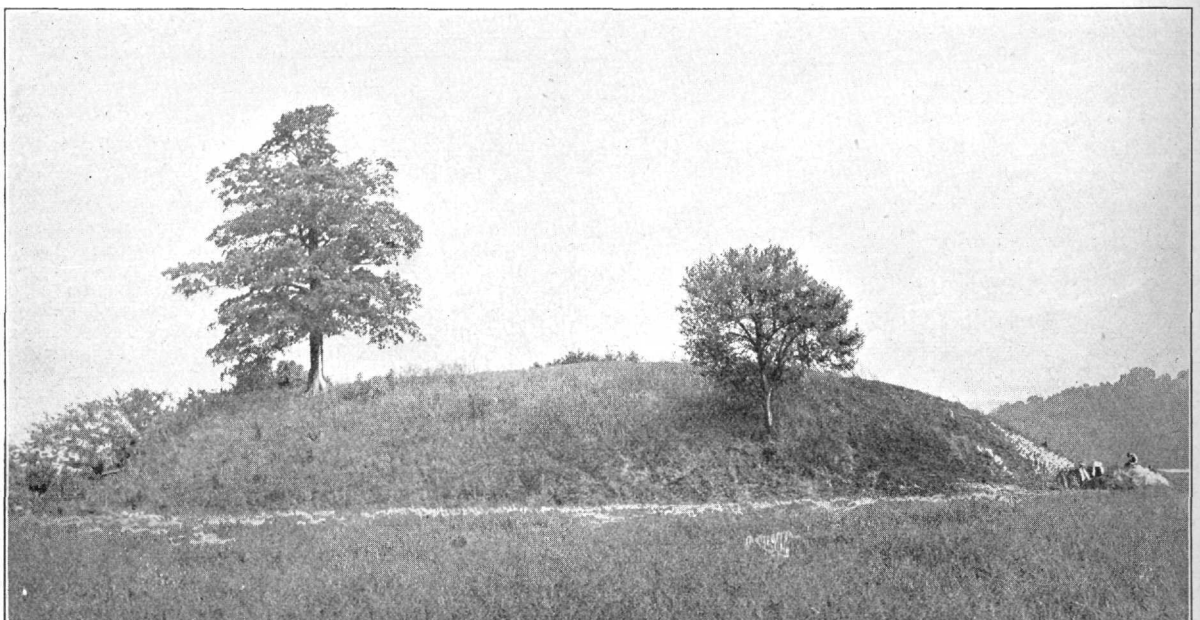
In the state of Ohio there are thousands of prehistoric mounds and earthworks which stand as monuments testifying to the skill and perseverance of their builders. Most of these mounds are simply piles of dirt covering or enclosing burials; others, however, upon excavation, reveal very elaborate and complex internal structures. Then there are the works classed as fortifications which usually occupy hill tops and lastly the so-called geometrical enclosures which are composed of combinations of squares, circles, rectangles, and other regular figures. Truly, the Indian was a builder and might, in a general sense of the word, be termed a primitive engineer.

The archaeologist's knowledge of the Indian as a builder is based primarily upon what he can learn from the excavation and examination of the various types of burial tumuli. We know from historical and archaeological sources that the Indian built houses of such perishable materials as wood, bark, matting, and skins of ani-

mals. Little evidence remains of structures of this kind—only traces of them are found occasionally in village sites or mounds. It becomes apparent that the major building activities of the prehistoric Indians were directed toward the erection of burial mounds and other tumuli in connection with the cult of the dead. Thus the early engineers expended their energies in designing and planning monuments to the dead, monuments that undoubtedly required the labor of the entire group or community.

While it is true that most of the simple mounds required very little skill on the part of the builders others are more complicated and at least involved the solution of simple architectural and engineering problems. As we cannot discuss all the structural problems that have been observed during the excavation of various Ohio sites we have chosen to describe some of the features that were encountered at the Seip Mound Group which is located in Ross County. This group is a typical example of the geometrical earthworks that are so common in south central Ohio. The two large mounds of this group and several of the smaller ones were excavated by Professor W. C. Mills and Director H. C. Shetrone of the Ohio State Archaeological and Historical Society. As may be seen by reference to the accompanying plan, this group is composed of two conjoined circles and one square. Within the larger circles are the two large mounds *A* and *B* and several smaller ones. Within the square are four small mounds locate opposite open-

LARGE CENTRAL MOUND OF SEIP GROUP



ings or gateways in the earthen embankments. The earthen walls of the enclosure were originally two or three feet in height and perhaps ten to fifteen feet in width.

It is evident that the Seip Mound Group and other groups of this type were laid out according to some pre-conceived plan. The people of this culture (the Hopewell Culture) possessed a social and religious organization which involved the erection of large and complex geometrical earthworks. Much has been written in the past concerning the regularity of these earthworks and many fanciful theories have been advanced attempting to explain how they were built. Since so many of these groups are composed of combinations of squares, rectangles, and circles, many of the early writers came to the conclusion that the builders must have had elaborate surveying instruments and considerable technical ability. This view was encouraged due to the fact that the pioneer archaeologists, Squier and Davis, claimed a greater regularity and symmetry for them than actually existed. They spoke of perfect squares and circles without going to the trouble to make accurate surveys. When the evidence is carefully considered the fact emerges that while none of the earthworks approaches exactness geometrically, some of them are very regular and would seem to indicate beyond doubt that they were laid out by some mechanical means. The regularity of the Seip group is shown by the accompanying plan.

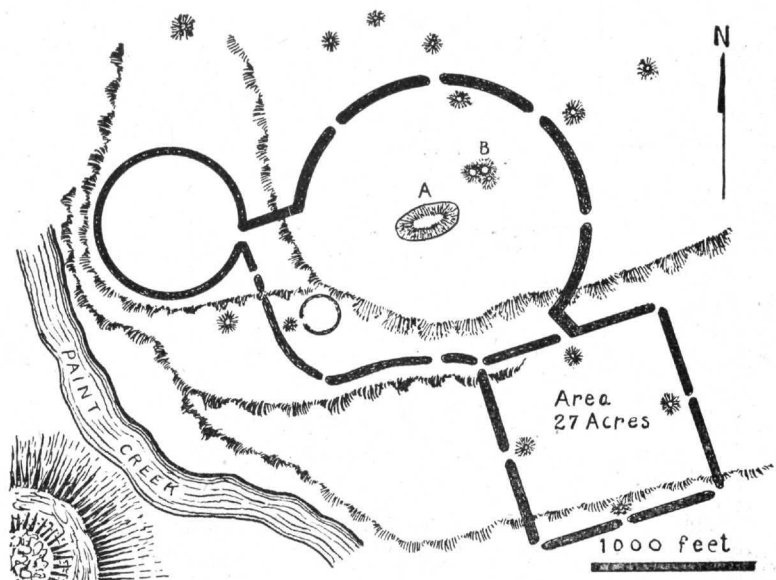
The late Gerard Fowke demonstrated by an accurate survey that the "Fairground Circle" at Mound Builders State Memorial at Newark, Ohio, approached a true circle. He showed that the circumference of a true circle fell within the zone occupied by the wall which varied in width between 35 ft. and 50 ft. (Its longest diameter is 1189 ft. and its shortest 1163 ft.) That such enclosures were laid out and planned ahead is borne out by a group near Alexanderville which is described by J. P. McLean in *The Mound Builders*. At this loca-

tion he found an unfinished earthwork of which he says: "These incomplete remains prove that all of these works were commenced at the same time, all abandoned before being finished, and all show what method was pursued in their construction. The three mounds of the smaller circle, we found not to be mounds at all, but intended to form component part of the intended circle, and were not placed in a straight line to the circle, but located on the line of the curve. The whole line was established before the work was begun, and work was performed on different parts of the line at the same time. This fact is also true of the square a short distance away."

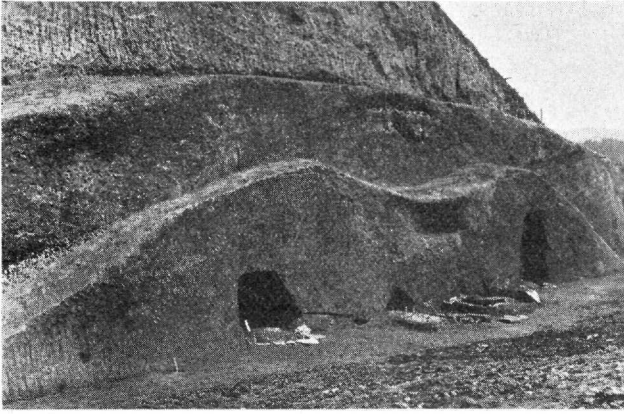
It becomes apparent then that the builders of the geometrical earthworks mapped out the various figures they desired before they began the task of piling up the required dirt. What were the instruments employed in the marking out of the enclosures at the Seip Group and those in other parts of the state? The simplest instruments needed for the construction of such figures are lines and stakes. Archaeological evidence shows that the peoples who built such enclosures possessed heavy cord or twine woven out of fibers of various kinds, and in addition, they had lines of leather or raw-hide. By securing one end of a line to a stake circles of various sizes could be laid out on the ground. Squares, rectangles, and octagons while involving more manipulations may also be marked out by these instruments.

Some idea of the magnitude of the construction work involved in the Seip Group may be gained by considering the large central mound. (Marked *A* on the plan.) This mound measures 250 ft. in length, 150 ft. in width and is 30 ft. high. It contains approximately 20,000 cu. yd. of dirt or about the same number of wagonloads. This may not seem to be very much to the present day engineer who with his gigantic steam shovels tears away whole mountain sides, but let us consider the tools with which the Indians had to work. The required dirt had to be scraped from the surface or dug up by simple im-

FIGURE 1
PLAN OF SEIP GROUP



Cuts Courtesy Ohio State Museum

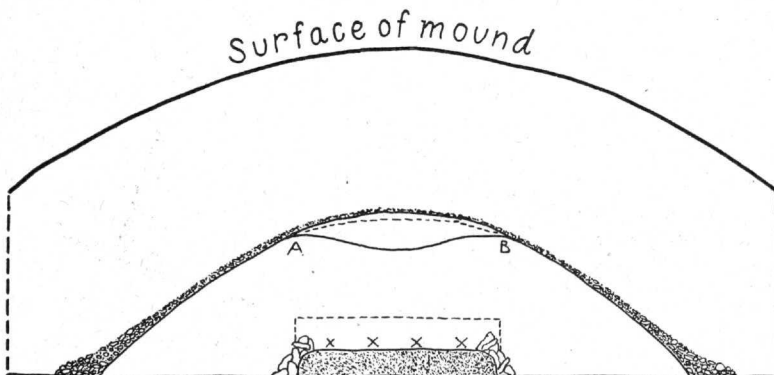


SECTIONAL VIEW OF MOUND

plements. These implements were made of stone, bone, shell or wood. Unfortunately for the archaeologist wooden objects are extremely perishable and very little evidence of them is ever found in excavating. Objects of stone last almost indefinitely while those of bone or shell, although less durable, are quite commonly found in mounds and village sites. The Indians possessed digging implements made from all three of these substances. Hoes made of stone or the common mussel shell were very common. These were undoubtedly mounted on wooden handles and were used like the modern iron hoe. Digging tools were also made from the shoulder blades of the larger mammals such as the deer and elk; such specimens have been found in several of the excavated mounds.

After the dirt had been loosened by tools of this nature it had to be transported to the burial area by hand, for the Indians had no domesticated animals (except the dog) or mechanical conveyances of any kind. The dirt was placed in small containers which were carried to the designated spot and emptied. That this is so is testified to by the structure of the mounds. When excavating a mound the archaeologist makes numerous cross-sections (vertical sections) so that he may better observe structural features. In many cases, on the surface of the section, lines may be seen which indicate the

FIGURE 2
CROSS SECTION OF MOUND



mode of construction. For example, some sections show that the mound is made up of innumerable small lenticular masses of earth of such a size as to indicate that they represent individual loads of dirt. In several cases the investigators have been able to definitely establish this fact for they found the imprints of basketry surrounding the small mass of earth—the carrier had dumped both his load and container on the pile of earth. The individual loads are often indicated very plainly in the section, for the workers secured their dirt at different spots, which resulted in layers of earth of various colors and textures being deposited adjacent to one another. Besides baskets the builders probably also utilized other containers such as pottery vessels, bags made of animal skins, bags made of woven fabric and boxes constructed from pieces of bark.

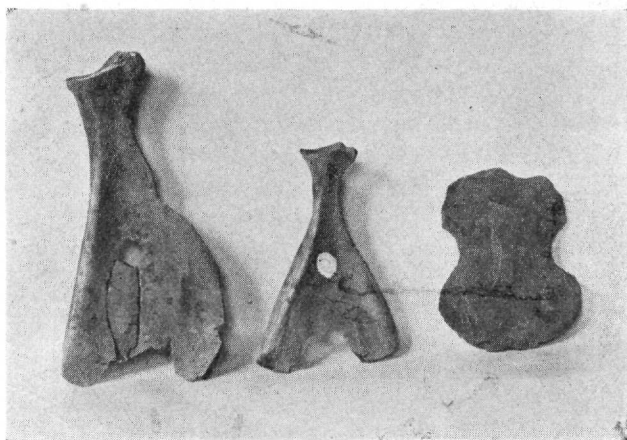
In describing the structural features that were found in the two large mounds of the Seip Group perhaps a more coherent picture will result if the attempt is made to reconstruct the process that was followed by the original builders rather than to describe the features as they were encountered by the archaeologist. As the two mounds were essentially alike the following remarks apply to one as well as the other. No detailed account will be given of the burials or the relics that were found with them since in this article we are primarily interested in the method of construction. The objects from this group may be seen on display at the Ohio State Museum.

After choosing the desired spot for their proposed burial ground the builders completely cleared it of all plant growth and leveled off the surface. The loose top soil was removed and a floor was made by plastering puddled clay over the area. Over this floor was scattered two or three inches of sand or fine gravel. The sacred area was then enclosed by a timber structure which consisted of posts set upright in the ground forming a fence-like affair. In some cases the enclosed area was partitioned off into smaller divisions. The evidence for this structure existed in the floor of the mound as post-moulds—moulds left by the disintegration of the wood. There is some evidence that indicates that perhaps some of the smaller compartments were roofed over. Within these sacred enclosures the Hopewell peoples carried on their elaborate burial ceremonies and prepared the graves for the dead. The majority of the bodies were first cremated although a few were buried in the flesh. Cremation took place in the so-called crematory basins which were constructed on the prepared floor of puddled clay baked by fire until hard. These basins were rectangular structures three or four feet in length, two or three feet in width and four or five inches in depth. After the bodies were cremated the ashes and charred fragments of bone were gathered together and placed in a specially constructed grave. Most of the

graves were rectangular platforms rising about a foot above the floor, varying in size according to the number of burials placed within them. Around the platform was constructed a log pen usually two or three logs in height. The logs were held in place either by stakes or by slabs of stone set on edge. Over the top were placed slabs of bark to protect the contents of the grave from the dirt that was eventually piled on top. Each grave was then covered with a small mound of earth.

When the sacred enclosure became filled with such graves the time was at hand for the final rites to take place. During the ceremonies, which were probably conducted by the medicine men or priestly groups, the wooden structure surrounding the grave area was destroyed by fire and the preparations were begun for the erection of the large mound which was to serve as a protection for the enclosed burials and as a lasting monument to the dead.

In constructing the large central mound (*A* of the plan) of the Seip Group the builders did not simply pile up the dirt at one time and consider the project finished. Much more was involved than this. Excavation of the mound showed that they first piled up a primary mound consisting of three conjoined lobes. Over this they placed a layer of heavy gravel varying from six inches to two feet in thickness. (Shown in the diagram, Fig. 2.) This gravel was undoubtedly used to prevent the loose dirt from being washed away by rainstorms or floods (from the adjacent stream) during the construction period. That they were bothered by such erosion was indicated by a water-laid deposit in one section of the primary mound. The gravel cover was probably placed in position as the mound was built up and not after its completion. After the primary mound was completed a number of seasons elapsed before the secondary mound of earth was added and the entire structure brought to its final state. The evidence for this was brought to light when the lobe of the primary mound containing a large multiple burial was uncovered. This section is represented in the diagram (Fig. 2). As we have noted before, log pens or tombs were constructed around and over the burial platforms. With the passage of time the wood of these structures decayed and the tombs collapsed. Hence, above each grave or tomb the earth sank down leaving loosely consolidated material or often a cavity in the primary mound. In the case of the large multiple burial shown in the diagram (Fig. 2) this also occurred and to such an extent that it affected the surface of the primary mound leaving a depression about two feet deep in the center. (Indicated by the line A-B in the diagram, Fig. 2, the crosses indicate burials and the dotted lines above them the log pen.) Before proceeding to add the dirt of the superstructure the builders first rebuilt the crest of the primary mound. That they did this was clearly indicated to the excavators on the cross-section.



DIGGING IMPLEMENTS

When this was done they were ready to complete the complex mound by piling up the dirt of the secondary portion. Still realizing the necessity of controlling erosion they first laid up a retaining wall of flat stone slabs around the outer circumference. This wall was from eight to ten feet in thickness and from one to two feet in height. The stone slabs varied in weight from a few pounds to one hundred pounds; some of them being set on edge. Upon this base or foundation course gravel was piled. Thus as the dirt was piled up the gravel retaining wall was raised with it, keeping the loose dirt from washing down and hindering the work. The gravel layer was continued up over the top of the mound, gradually decreasing in thickness. The final process consisted in covering the retaining wall with a foot or two of earth. With the completion of this last step the job was finished and the people of the community returned to their everyday life.

In this brief and generalized description of the construction activities of the mound building Indian we see these prehistoric peoples in a new light. We can no longer think of them as a people who were incapable of planning and carrying out community enterprises but must envision them as builders with foresight—prehistoric engineers, who, with the sustained efforts of the entire group, were able to conceive and complete elaborate projects.

FIGURE
LOG TOMB AROUND BURIAL

