

PHILLIPS ACADEMY, ANDOVER, MASSACHUSETTS
DEPARTMENT OF ARCHAEOLOGY

BULLETIN VI

Hematite Implements of the United States

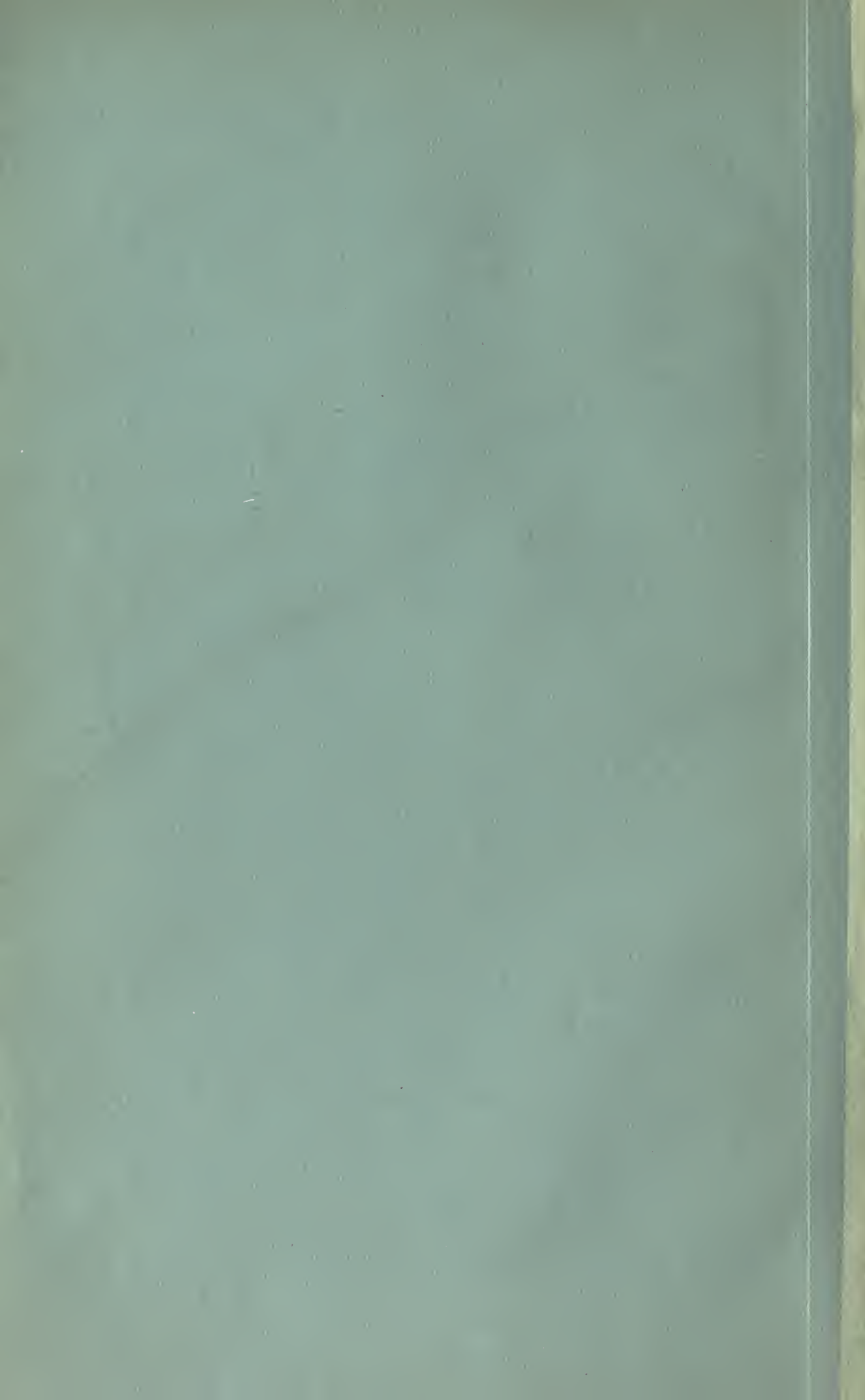
Together with Chemical Analysis of
Various Hematites

By WARREN K. MOOREHEAD, Curator

PRICE 50 CENTS (POSTPAID)

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ACKNOWLEDGMENT

I desire to thank several persons who have been of assistance to me in the preparation of this Report. First of all, Dr. H. M. Whelpey of St. Louis has my gratitude for his hearty coöperation. He placed at my disposal his data and collection.

I am also indebted to Professor Wm. H. Holmes of the Smithsonian Institution for permission to reproduce his paper upon the Missouri paint quarry and to Dr. J. F. Snyder of Virginia, Illinois, and Mr. H. M. Braun, East St. Louis, Illinois, for information. Professor Wm. C. Mills counted and classified the hematites in his exhibit, and has my thanks. The following persons replied at greater or less length to requests for data as to Hematites. I thank them all.

Mr. F. P. Graves, Mr. Clarence B. Moore, Dr. George G. MacCurdy, Miss H. N. Wardle, Messrs. Luther A. Norland, Dr. W. C. Barnard, H. F. Burkett, Frank L. Grove, Dr. Charles F. Noe, John W. Wright, and others.

GENERAL OBSERVATIONS ON THE HEMATITE AREA

The distribution of objects of various forms of iron ore, ferruginous stone or hematite is general through more than half of the United States. Setting aside remote portions of the country where very few objects of stone carrying iron, or iron oxides predominate, one may roughly bound the territory in which hematites are found as follows:—From Fort Worth, Texas, straight north through Oklahoma, Kansas and Nebraska to Omaha, north to Minneapolis, then to Duluth, east to northern Michigan, thence to Ottawa, Canada, south to Trenton, New Jersey, thence to Raleigh, North Carolina, thence to Montgomery, Alabama, and west to Fort Worth, Texas. Implements of hematite are occasionally reported outside of this area; but after careful study of specimens in public institutions, correspondence with persons familiar with the types existing in their localities and the reading of numerous reports and papers, it is my opinion that the great country enclosed within the bounds referred to constitutes the so-called hematite belt.

Within this territory hematites are most numerous in Missouri, southern Iowa, Illinois, Indiana, Ohio, West Virginia and Kentucky. They are found in considerable numbers in Tennessee, New York, Wisconsin, and portions of Arkansas. But while that is true, the far greater number of these implements lie within a territory about the size of the state of Texas.

The preponderance of these objects are not found with burials in mounds or graves, but upon the surface, and it does not follow that wherever a hematite object has been picked up there at one time existed a camp or village at that particular spot. True, implements made of this ore sometimes occur with burials of various sorts but not in sufficient number to indicate clearly the use and purpose for which some of the types of hematites were made.

Wherever quantities of hematite implements finished or unfinished occur, and especially if there are other indications of human occupation such as village-site debris, it is self-evident that a village of more or less permanency occupied that site. However, it would appear that the knowledge we are to obtain



FIG. 3 S. 3-5. ANDOVER COLLECTION

Group of hematite celts. The square, oval and pointed types.

from these implements, must be through a study of them *en masse*. And with that end in view I have assembled all the observations of other writers and have done what little I could to clear the mystery.

In order to compare the hematites of different colors and apparent varying hardnesses, I asked Mr. James C. Graham, head of the Department of Science, Phillips Academy, to make careful analysis of implements of several kinds, and these analyses will be found on page 51 of this report.

The distribution of hematite objects seems somewhat different from those of other forms of prehistoric artifacts. The bicave or discoidal stones overlap the territory of hematites, but cover less in extent. The bird-shaped stones so common north of the Ohio river are rare in sections where hematite implements abound; notably Missouri.

A careful study of these hematites will aid us in determining the general distribution of other and different types. For I am persuaded that in the past we have given scant attention to the technical study of these and other forms of implements.

Having established the various areas in which certain types occur it may be possible, some years hence, for us to arrive at conclusions. Without such study, we must regard these objects as problematical forms — as we have in the past — occupying case room in our exhibition halls and of no particular meaning or consequence.

Beyond question, we have far too many such exhibits — of types concerning which we, as yet, know little. While this pamphlet presents no final solution of the "hematite problem," surely there can be no harm in classifying these hematites and in calling attention to certain facts, although in our study we have little to aid us save the specimens themselves. Our histories, or narratives of travels among Indians are silent on the subject. Archaeologists have done no more than to mention them briefly. Therefore we must depend on an examination of types.

And if we depend on archaeology alone our study is confined not only to the specimens themselves, but must of necessity be analytical in character.

In stating that the many narratives of travelers, the observations of ethnologists and others sent among Indians, are of little or no value to us in making clear the purpose of these peculiar objects, I mean that in so far as my observation and reading extends, I fail to obtain any certain light on this subject. If there are specific references to objects made of hematite in the records of early travelers in America, I stand corrected. Up to the present time we have few references at any length to these specimens. Such as one may consider of importance are presented in the bibliography on page 100 of this report.

We do not need to concern ourselves with a study of hematite throughout the world. The softer grades of iron ore and the oxides were used by primitive man pretty generally, it is safe to assume. That is, they furnished him with paint. Outside of the United States hematite does not seem to have been made into implements or ornaments.



FIG. 4. TYPICAL HEMATITES S. 1-2

- These are from the collection of Geo. Y. Hull, St. Joseph, Mo.
1. Celt from mound, Andrew County, Missouri. Smooth and well made but not polished.
 2. Plumb much pitted by age, surface find. Callaway County, Mo.
 3. A fine truncated cone used as a paint grinder. Top of cone is worn and depressed from use. Surface find. Callaway Co., Mo.
 4. Finely polished celt, surface find. Doniphan Co., Mo.
 5. From an old grave near the village-site at Wathena, Kansas.
 6. Axe with flat top and flat side,—a surface find, Callaway Co., Mo.
 7. From an old village site at King Hill, St. Joseph, Buchanan Co., Mo.

The difference between the celts is self-evident, number 1 and 4 being square, and 5 and 7 oval.



FIG. 5. S. 2-5. ANDOVER COLLECTION.
Grooved axes from Missouri. The more common forms.

HEMATITE IN THE PALAEOOLITHIC AGE

No one denies that the caverns and rock shelters of the south of France and particularly the valley of the Vézère near Les Eyzies, where about sixty caverns occur, represent the habitations of the most primitive man. In fact, in the lower layers of these caverns in the epoch known as Acheuléan, the implements indicate that man was but slightly in advance of the being represented by the Chelléen type found in the gravels of Abbeville and at St. Acheul, farther north.

In the period embraced from 1860 to about 1871, Messrs. Edouard Lartet and Henry Christy made their famous explorations of caverns in southern France. On page 22 of *Reliquiae Aquitanicae*, their beautiful report, (a report, by the way, equal to anything published by either the French or the English since) they make this statement: "Various pieces of soft red hematite, covered with scratches, indicate how they scraped off a red powder which, mixed with grease, would furnish as good means of personal adornment as is employed by many Indians at the present day."

When in France last summer, I visited Les Eyzies, spent over two weeks inspecting a number of the caverns and was interested to observe in the collection of Mr. Otto Hauser a number of fragments of soft hematite which palaeolithic man of thousands of years ago undoubtedly used as paint for personal adornment.

Interesting as this subject is, it is not my purpose to enter upon a discussion of the widespread use of hematite as a paint among savage people in other countries. The fact remains, it must have been, quite probably, the favorite paint, as it has bright red, light red, brown, and sometimes almost yellow colors and existing in very many parts of the world it was appreciated by the earliest man, beyond question.

Whether he made implements or ornaments of the heavier and harder hematite in foreign countries, as he did in America, is a question I leave to the consideration of students more familiar with the European field.

In our own country the hematite was not only made use of for decorative purposes, but it served for a multitude of implements and weapons and a few ornaments and game stones.

THE CLASSIFICATION OF HEMATITES

I made a primary classification of hematites in "The Stone Age in North America," Volume II, page 301. While this is more or less correct, it is a skeleton classification and should be expanded.

The Committee appointed by the Anthropological Association of America to formulate a primary classification and nomenclature of prehistoric artifacts did not consider the hematite objects. Therefore the following classification is submitted upon my own responsibility, and I shall be very glad to have others indicate wherein it should be expanded or contracted.

Apparently tools	{ Edged objects	Celts { Oval form Square form One face convex, other face beveled square form, broad edge, pointed poll Grooved axes { Ordinary form Grooved in center
Oval or elongated	Plummet shape Egg shape, flattened	{ Slender Rounded or egg-shape Pear and bell shape
Cone shape	{ Pointed cone Mound shape, top rounded	
Paint stones		
Irregular forms		
Apparently ornaments or problematical	{ Tablets Bicaves Chipped discs Pendants Effigies Winged and perforated	
Projectile points	{ Spear-heads Arrow heads	



FIG. 6. S. about 1-3

Group of nine grooved hematite axes, from eastern and central Missouri. Collection of F. P. Graves, Doe Run, Missouri.

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Apparently tools	Edged objects	<ul style="list-style-type: none"> Loose { Oval form { Square form { One face convex, other face beveled { Square form, broad edge, pointed poll
		<ul style="list-style-type: none"> Grooved axes { Ordinary form { Grooved in center
Oval or elongated	<ul style="list-style-type: none"> Plummet shape Egg shape flattened 	<ul style="list-style-type: none"> { Slender { Rounded or egg shape { Pear and leaf shape
Cone shape	<ul style="list-style-type: none"> { Pointed cone { Mound shape, top rounded 	
Paint stones		
Irregular forms		
Apparently ornamental or problematical		<p style="text-align: center;">FIG. 6. 2. about 1-3</p> <p style="text-align: center;">Group of nine grooved hematite axes, from eastern and central Missouri. Collection of F. P. Graves, Doe Run, Missouri.</p>
Projectile points		<ul style="list-style-type: none"> { Spear-heads { Arrow heads





FIG. 7. S. 4-5. ANDOVER COLLECTION.

Various pieces of hematite, partly worked. Five from Ohio, one from West Virginia, and one from Kentucky.



FIG. 8. S. 1-5. ANDOVER COLLECTION

This figure illustrates three grooved axes in the lower row; an unfinished hematite implement of unknown purpose and a hematite nodule above. Hematite axes are frequently found in Missouri, but seem rare elsewhere in the country. The groove may entirely encircle them, or be faintly indicated on the back. But usually they are grooved entirely around. The one in the lower left-hand corner has a broad, sharp, cutting edge. Naturally, because of its hardness, hematite made excellent axes. They retained their edges longer and more nearly approached the modern iron axe than any other aboriginal tool.

TABLE SHOWING DISTRIBUTION OF HEMATITES IN THE
A. E. DOUGLASS COLLECTION

United States	Mineral Lumps	Paint Lumps	Balls and Hammers	Grooved Axes	Tomahawks	Club Stones	Celts & Cutters	Banner Stones	Gorgetts	Ornaments	Grooved Plumes & Sinkers	Arrow Points	Conical, Ellip. & Hemispherical Burnishers	Pear Shaped Pendants	Totals by States
E. of Rocky Mountains	2	7	2	1			7		1		5		6	1	31
New York							2		1				1		2
Pennsylvania									1						3
Virginia						1	113		3	3	10		41	1	207
West Virginia		30	5			1	4		2		3		8	1	19
Kentucky		1				1	1		3				3	1	7
Tennessee		1				4	177		5	2	22	3	65	11	311
Ohio		14	5	1											1
Indiana						4							3		7
North Carolina						9									9
Georgia						2		1	8	8	25	1	40	13	464
Missouri		154	1	19	4		187							14	32
Illinois				3			7						8		1
Iowa							1								
Totals	6	207	13	24	4	21	499	1	20	13	65	4	177	42	1096

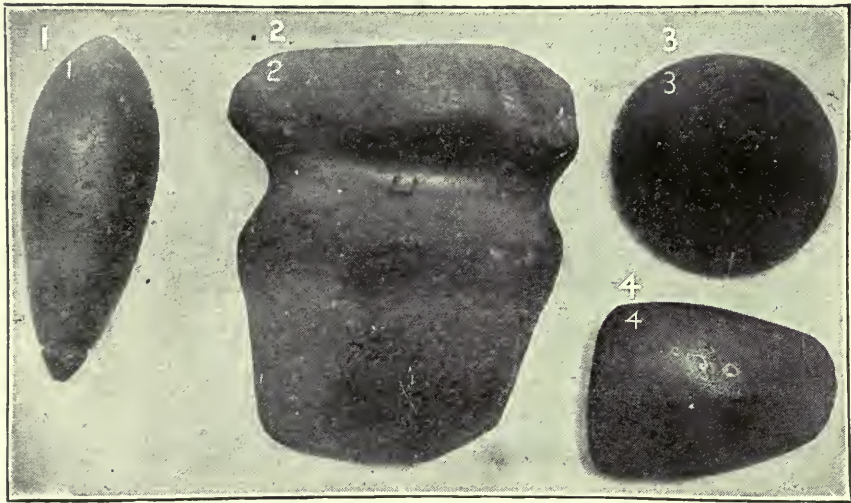


FIG. 9. S. 1-2

Hematite objects from the collection of Dr. Henry M. Whelpley, St. Louis, Missouri. Hematite plummet to the left, grooved axe in the center, a hematite cone to the right, a celt in the lower right-hand corner. All Missouri surface finds.

THE OUTLINES OF TYPES

In Figure 2 I have shown but four divisions of hematites, the celts, grooved axes, plummets and cones. The ornamental, problematical, bicave and miscellaneous divisions are not sufficiently complete to permit us to present outlines. The irregular pieces of hematite, those used for burnishers or polishers (two of Douglass' terms) and the triangular and octagonal fragments — apparently paint stones — are omitted.

The celts have more highly specialized edges than is observed in the stone celts. We have indicated this difference in the side view of the specimens. The edge of the average stone celt is seldom different from the top or poll save that it is sharp. But in the hematite celt the edge is keener, is more polished and may be beveled or slightly curved.

In the axes I have omitted the double bitted axe and the axe with the flat back, or triangular axe. These are rare in hematite. The plummets and cones or hemispheres, cover the range of unknown forms in this material fairly well. There might have been added under the plummets, the egg-shaped, grooved plummet, one side more or less flat. These are rare, but seem to constitute a type. Dr. Whelpley has about fifty of them.

The various types and sub-types of the classification will be found illustrated by specimens throughout this BULLETIN as follows:

CELTS

Oval form, Fig. 4, No. 7, Fig. 9, lower right-hand corner.

Square form, two in Fig. 3; Fig. 4, Nos. 1 and 4.

One face convex, other face beveled, Fig. 3, right-hand specimen.

Square form, broad edge, Fig. 3, top to left.

Pointed poll, Fig. 3, second from bottom.

GROOVED AXES

Ordinary form, Figs. 5 and 22.

Grooved in center, Fig. 43.

PLUMMETS

Plummet-shape, slender, Fig. 9, left-hand specimen, two in Fig. 31.

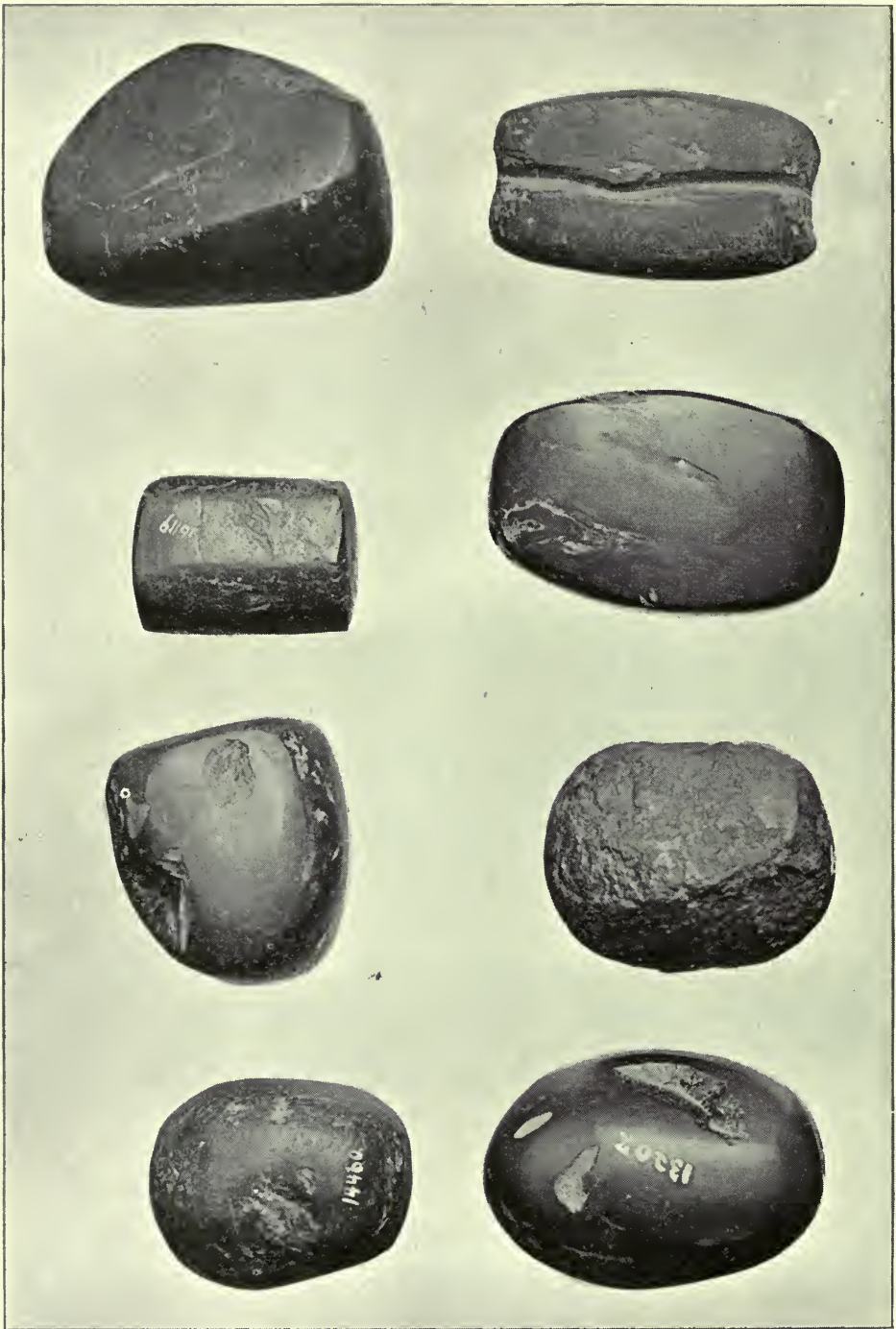


FIG. 10. S. 34. ANDOVER COLLECTION.

Irregular forms — all polished except the grooved one, and that one above No. 13207. All from Ohio except No. 16119, which was found in Indiana.

Plummet-shape, rounded, Fig. 31, center.

Pear and bell shape, Fig. 13, central figure, lower row.

Egg-shaped, grooved in center, Fig. 30.

PAINT STONES, CONES, ETC.

Paint stones, Fig. 7.

Rubbing stones, Fig. 10.

Projectile points, Fig. 48.

Pointed cone, Fig. 28.

Mound shape or hemisphere, Fig. 29, and one in Fig. 46.

ORNAMENTS OR PROBLEMATICAL

Ornaments and tablets, Figs. 41, 45 and 51.

Bicaves, Figs. 42 and 49.

Chipped discs, Fig. 37.

Pendants, Figs. 32 and 33.

Winged objects, Fig. 44.

Perforated, Figs. 50 and 52.

Effigies, Fig. 42, lower left-hand corner, Fig. 47.



FIG. 11. S. about 1-2. ANDOVER COLLECTION

Top row — mass of hematite, a peculiar axe-celt and a nodule.

Lower row — a ball, and an unfinished object.

Three from Ohio, two from Missouri.

OBSERVATIONS OF OTHERS UPON HEMATITE

The longest reference to hematites is found in the "Handbook of American Indians," Volume I, page 542. It is written by Professor Holmes, and I quote it in full.

"HEMATITE. An iron ore much used by the native tribes for implements, ornaments, and small objects of problematical use. It is found in many parts of the country and in great abundance in the Iron Mountain district of Missouri and in the Marquette region of Michigan. It occurs as a massive ore, as nodules, and in other forms, distributed through rocks of various classes, and is usually dark in color, showing various shades of gray, brown, and red. The specular varieties are generally rather gray, and have a metallic luster. The red, earthy varieties, when compact, are known as red chalk, and when much disintegrated and pulverulent, as red ocher. They were, and are, much used as paint by the aborigines, and small quantities, either in lumps or as powder, are commonly found in ancient graves, placed there for personal embellishment in the future existence. The highly siliceous varieties are often very hard, heavy, and tough, and make excellent implements. They were used especially in the manufacture of celts, axes, scrapers, etc., and for the rudely shaped hammers and sledges that served in mining work, as in the iron mines at Leslie, Mo. Many of the celts and celt-like implements are quite small, and in some cases probably served as amulets. Grooved axes of this material are of somewhat rare occurrence, but objects of problematical use, such as cones, hemispheres, and plummetts, are common, and on account of their high finish, richness of color, and luster, are much prized by collectors. Hematite objects are found in mounds and on dwelling sites in the middle Mississippi valley region in the Ohio valley, and extending into E. Kentucky and Tennessee to W. North Carolina, and to a limited extent in the South, in the Pueblo country, and on the Pacific coast. A small, well-shaped figure of this material representing a bird, and neatly inlaid with turquoise and white shell, is among the collections obtained by Pepper from the Pueblo Bonito ruin, New Mexico. Hematite is

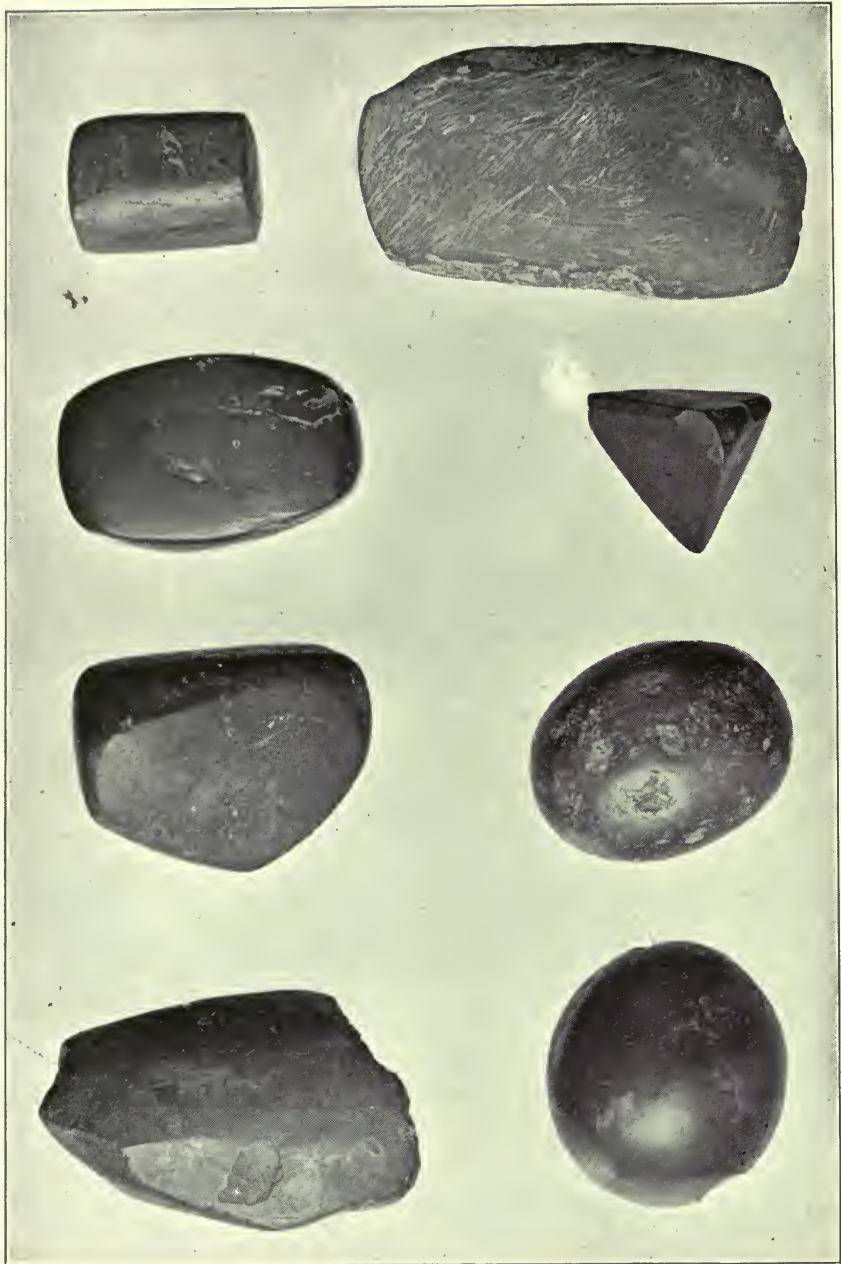


FIG. 12. S. 3-5

Eight hematite objects from the Andover collection. In the upper right-hand corner is a hematite pebble, polished on two of its angles and rough on the other side. This illustrates how hematite was cut and ground until reduced to the desired shape. Flint scratchings are still plain on the surface. Just beneath it is a triangular bit of hematite. The flat surface may be due to grinding in order to obtain paint. Beneath are two hematite cones. The four specimens to the left represent irregular pieces.

not always readily distinguishable from limonite (which is generally yellowish or brownish in tint), and from some other forms of iron ore."

During the preparation of this BULLETIN I addressed numerous letters to museum Curators, persons who had carried on more or less extensive explorations and to students of American archaeology. Their replies indicated that the area assigned is ample to include practically all the true hematites in the United States.

PHILADELPHIA, Nov. 1st, 1911

"I have met with so few hematites that it might be said with truth that I have found practically none."

CLARENCE B. MOORE.

PHILADELPHIA, Nov. 3rd, 1911.

"At Mr. Moore's request, I have looked over his collection, and find, besides the two plummet-shaped pendants of hematite — one of which is dark red and the other steel-grey — which he has referred to in his letter as having been plowed up near Brodnax, Morehouse Parish, La., two other pendants of the same general type, one — steel grey — from the Indian cemetery on the Keno place, Morehouse Parish, La., and one — possibly unfinished since there is no groove nor perforation for suspension — found with Burial No. 4 in the Indian cemetery on the Ward place, Morehouse Parish, La. This last is of a very dark grey color, almost black. Aside from these four, I have found no objects of hematite in the Clarence B. Moore collection."

H. NEWELL WARDLE.

EAST ST. LOUIS, ILLINOIS,

Dec. 27th, 1911.

"Some time ago I received from you a circular letter, entitled 'Information desired regarding Hematites,' and in reply will endeavor to convey to you my personal observation regarding same. First of all, I do not believe that an accurate estimate could be made as to which particular specimens of hematite predominate in this locality, say in a radius of 100 or 150 miles. My personal

observation is as follows: grooved axes seem to predominate in Missouri, or west of the Mississippi River, with the exception of St. Charles County, at which place I feel the plummets predominate, with axes next, and celts occurring sparingly. In Illinois the order of things seems to be reversed, but no hard and fast rule can be followed. As a general proposition the Illinois hematites are better worked, but it is singular to note the difference in the frequency with which certain objects occur, in different localities, although not more than 20 or 30 miles distant from one another. In my immediate locality, say a radius of 20 miles, celts absolutely predominate, all finely polished; next comes axes, also of fine workmanship; next in order are plummets, usually good, and often very fine. The grooved plummets are the commonest, perforated plummets being scarcer, but if found at all, are very finely polished. Cones are scarce, and I only recall five having been found in this immediate neighborhood. About 30 miles north, in Jersey County and Calhoun County, and more especially along the Illinois River, a different condition exists with reference to frequency with which certain hematite objects are found. In the latter locality plummets predominate (50 to 1) celts are few, and grooved axes scarce, but more cones are found than in any other locality in Illinois. I want to qualify my statement, however, with reference to cones somewhat. Cones are very scarce in Illinois, hence I do not want to leave the impression that Jersey County, or the Illinois River country is full of cones, but to the contrary they are highly prized by collectors, and out of about fifty collections two contain cones. A few very fine polished hematite discoidals have been found in Jersey and Calhoun Counties, but these are very very scarce. Hematites become scarcer as one goes south in Illinois.

My collection of hematites consists of the following specimens:
60 grooved axes (one of which has been re-worked).

41 celts.

92 plummets (of which 9 are perforated and 3 are unfinished).

7 cones.

2 gorgets (2 perforations each) know of no others in this locality.

Of course, I have only enumerated local specimens, from a



FIG. 13. S. 4-5. HEMATITE PLUMMETS FROM OHIO. Andover Collection.

Three are grooved—two in the center. No. 14446 has a pecked (not cut) groove. No. 14453 is not grooved. No. 14017 is an unfinished form—groove just begun.



FIG. 14 (See page 59)

General view of the Iron Mine, showing face of the ore body to the right with openings of the ancient mines.

radius of about 100 miles, and will leave you to draw your own conclusions.

For the present I am unable to say anything further upon the above subject, except that hematites are not found interred with bodies in this locality, but are invariably surface finds in the fields and creeks. We find many of the variegated colors of hematite, with black predominating, and the steel-gray the scarcest of them."

H. M. BRAUN.

VIRGINIA, CASS Co., ILLINOIS.

"Indian implements of hematite are very rare here, near the junction of the Illinois and Sangamon rivers, a region long inhabited by prehistoric aborigines. Some years ago a fine grooved axe of hematite, six inches long by three inches wide and smoothly polished, was found on the Sangamon bluffs a few miles north of this place, the only one of that class discovered, so far as I know, in a radius of many miles. The most numerous objects of hematite in central Illinois are the so-called plummets, several of them having been unearthed in this and adjoining counties from mounds and old camp sites. In my collection are perhaps a dozen small polished celts, or chisels, of hematite, and numerous hematite paint rocks, and a few small hematite cones. A very rare specimen I have is a perfect arrow point of hematite, well barbed and polished, 1 1-2 inches in length, found in Brown County, in a mound on the Illinois river bluffs. Another unique object, I recovered in the same locality, is a thin flat 'tablet' of the same mineral, 2 1-2 inches in length and 1 1-2 inches in width, highly polished, with a perforation about an inch from each end.

"All the hematites I have seen collected in this part of Illinois are of the dark iron ore evidently obtained at Iron Mountain in southeastern Missouri. The paint rocks I have mentioned are probably the same that you designate as "rubbing stones." In none of our local collections have I seen any unfinished hematites; from which it may be inferred that they were imported as finished products, and not made here. I have heard of no deposits, or caches, of hematites in this part of our state; and very rarely, if ever, are fragments of hematite found here among



FIG. 15

View of the mine wall, showing traces of the ancient tunnels, extending down through the ore body.

the flint chips of the ancient open air workshops. The perforated 'tablet' I have was found with a skeleton in a Brown County mound; and three of the hematite plummets — also one of limestone — were found interred with human skeletons within 20 miles of the mouth of the Sangamon river."

DR. J. F. SNYDER

Mr. H. F. Burkett, Findlay, Ohio, who has for forty years been engaged in a study of the various types of implements found in Hancock County and vicinity, advises me under date of November 18, 1911, that he never knew of an object of hematite having been found in his region.

Doctor George Grant MacCurdy, Curator of the Peabody Museum at Yale, states that there are few hematites in their collection and all of these come from the Ohio valley.

Mr. Luther A. Norland of La Jara, Colorado, writes that he knows of no hematite objects having been found in Colorado. Mr. Norland has made an extensive collection in his region.

Doctor Charles F. Noe of Amana, Iowa, informs me that in his collection of 1500 local specimens there are but five objects of hematite. All of these are of the dark or purple hematite, almost approaching black in color, and are very hard, and have been found on the surface and not with burials.

Mr. Frank L. Grove, Secretary of the Archaeological and Historical Society of Delaware, Ohio, states that very few hematites have been found in his region. He knows of none save a few celts of this material.

Dr. W. C. Barnard of Seneca, Missouri, has a large collection of prehistoric objects from his region and among these are numbers of hematites. In Fig. 53 I show a group of fine hematite axes and other forms from his collection. Apparently grooved hematite axes predominate.

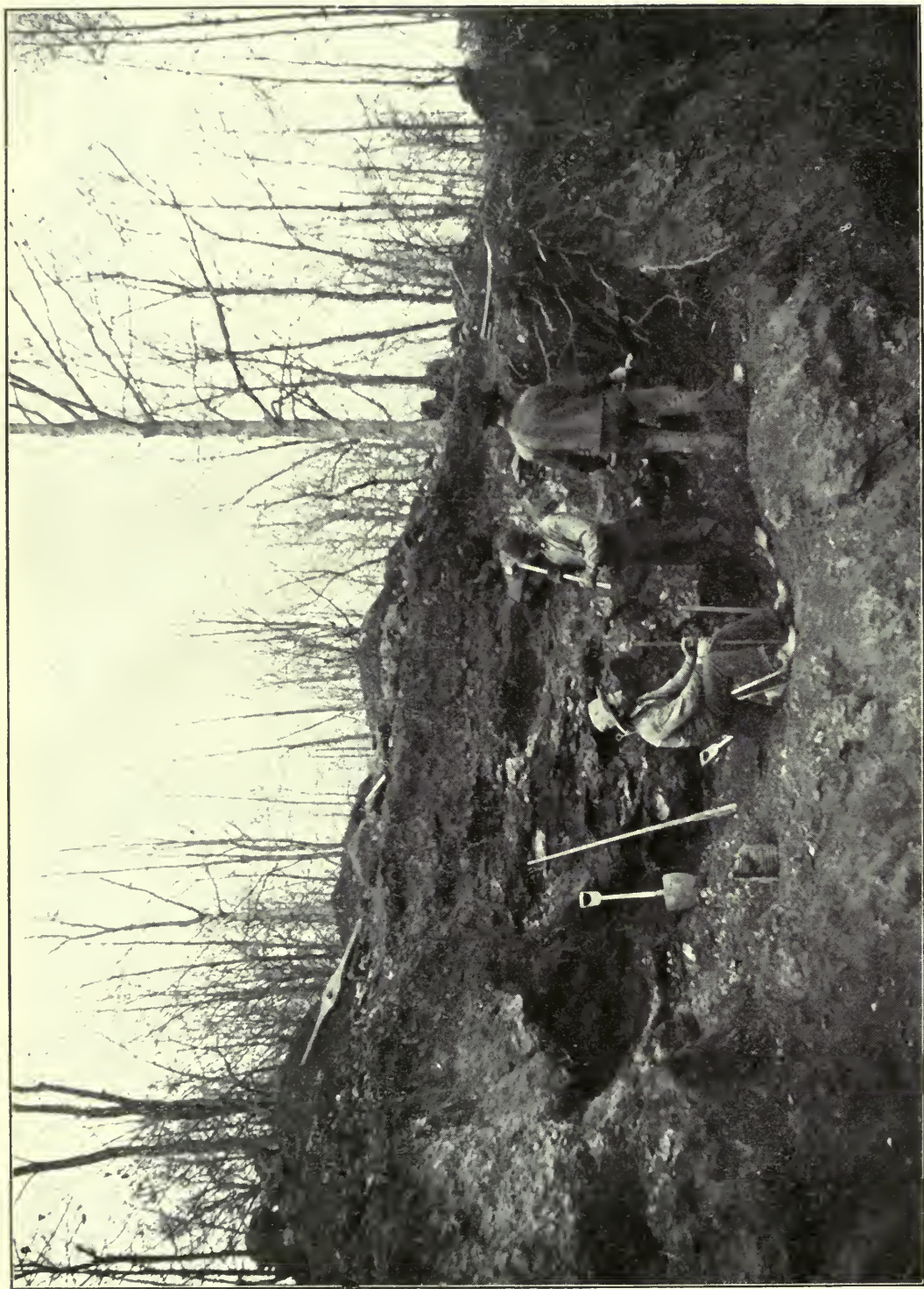


FIG. 16

Workmen on the outer margin of the mine discover open galleries beneath.

DR. WHELPLEY'S COLLECTION AND STUDY

The largest collection of hematite artifacts in the United States and quite likely in the world, is that owned by Doctor H. M. Whelpley of St. Louis, Missouri. Doctor Whelpley has made a special study of these interesting artifacts for twenty-five or thirty years and it may be no exaggeration to state that he is better posted with reference to their distribution, the character of implements and the conditions under which they are found than any person in this country. Certain it is that in all correspondence our Department has had with reference to hematites, no institution or individual has been able to give us the amount of detailed and valuable information equal to that submitted by Doctor Whelpley, and I am glad to here record my obligation to him.

The correspondence with Doctor Whelpley extended from November 20th, 1911, through March, 1912. The Doctor sent me a large number of photographs of his specimens together with some fragments for chemical analysis. Omitting the dates of communications and selecting the essential facts and observations obtained by Doctor Whelpley the past twenty years, I sum up his conclusions as follows:—

In the region lying about St. Louis, and especially towards the west and northwest, the hematite is not only numerous but all colors are present from light to dark red and steel gray. These objects with few exceptions are found on the surface through cultivation of the soil. Occasionally they are washed out by the action of streams. He has secured paint stones from graves, and heard of a hematite plumb-bob being found in a grave, but the details are not available. Hematite pieces have been found around the mounds but none with burials in the mounds so far as he is informed. The frequency with which these objects occur is indicated by the table submitted by Doctor Whelpley, printed on page 40 and arranged according to preponderance.

Hematite paint from Indian graves and village sites as well as crude hematite from workshops is represented by numerous fine specimens. His collection of about 1700 specimens was found

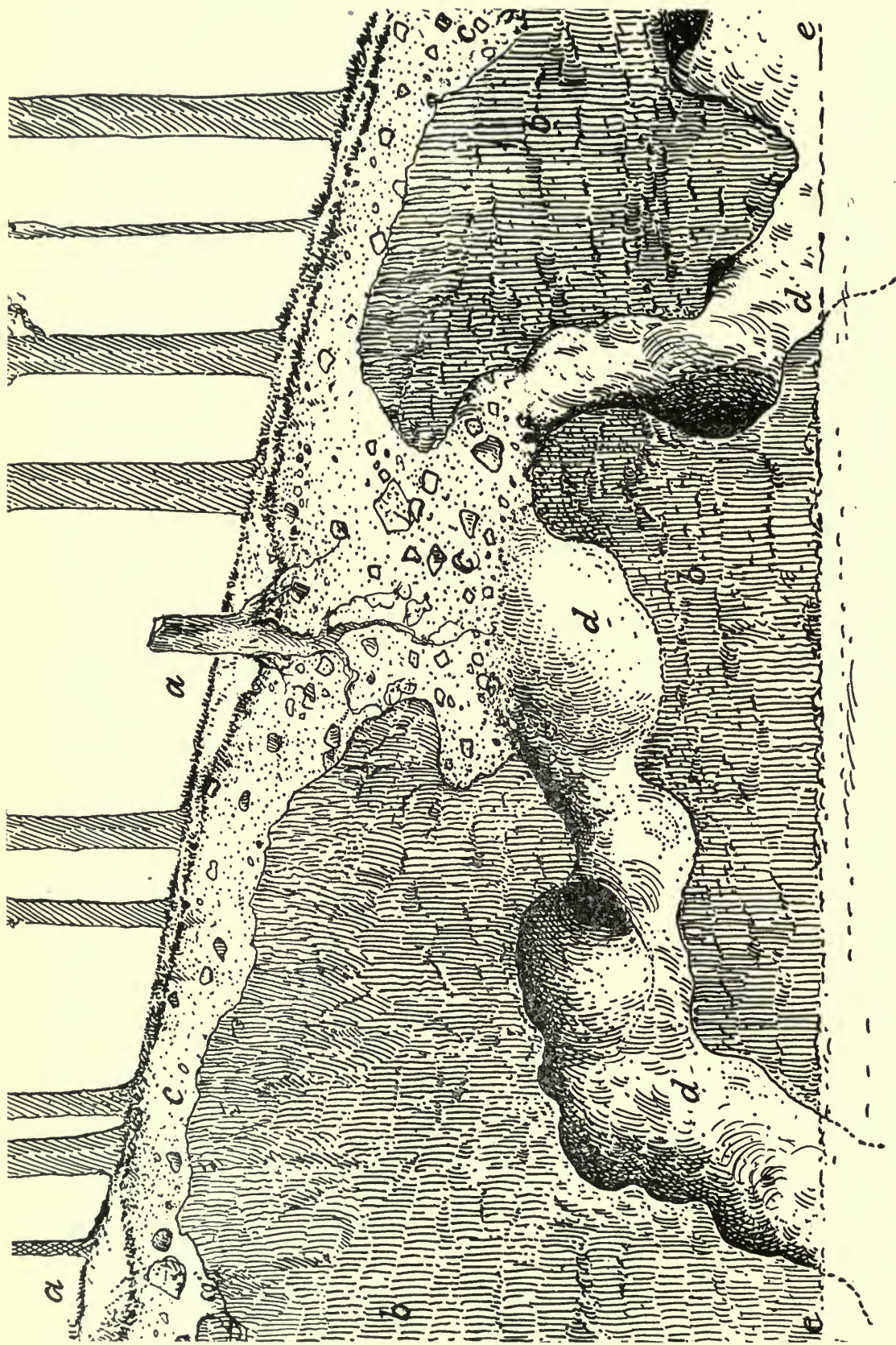


FIG. 17

Section indicating the manner in which the ancient galleries or borings penetrate the ore body.

within a radius of 150 miles of St. Louis. He has seven hematite celts said to have been found in a cache, but he is not able to verify the report.

“In the district west of St. Louis, extending to the Missouri River, hematite axes predominate. Plumb-bobs are relatively scarce. A few celts are found. Across the river in Illinois, very few hematite axes are found, while celts are comparatively plentiful and cones almost as numerous as plumb-bobs.”

“As far as I have been able to observe or learn, the Indians never mined hematite for use in making artifacts. They picked up pieces of suitable size and shape and worked each piece down to a single article for use. I do not think the Indians very often broke large pieces of hematite and made several things out of the small pieces. They usually found a piece of the right size to work it down into the desired object. I have numerous pieces from the crude nodule to the finished objects, showing the stages in making grooved axes, plummets, cones, celts, etc.

“The so-called hematite mine at Leslie, Franklin Co., Missouri, which was discovered a few years ago, proved to be a place where the Indians mined paint but not hematite. It is true that the Indians broke off some of the hematite in this mine, but that was in order to make room for work in quarrying the paint.

“The pieces of hematite found on the surface in Missouri, no doubt, were as easily worked as any that could be quarried or mined.”

Doctor Whelpley explains how that he was able to make so large a collection of these implements by the fact that his medical and pharmaceutical friends have been very kind in assisting him in securing specimens and information.

The percentage of ornaments or problematical forms in his collection would seem abnormally high in any other exhibit. Hundreds of common forms of celts, plummets and other objects offered him he did not purchase, his series in these forms being practically complete.

He states that there are a number of hematite objects offered for sale, of recent manufacture, with intent to defraud. Hematites of recent manufacture appear fresh, are not patinated, and after much experience it is easy to distinguish them. I have not

compiled a complete table of his collection for the reason that he did not secure all the specimens offered him. Dr. Whelpley has a special collection for study and comparison of over one hundred fraudulent or mutilated specimens.

Axes — 487	Ceremonials
Celts — 426	Bars
Plummets — 311	Pestles
Paint Stones — 206	Discs
Cones — 147	Tubes
Gorgetts	Bicaves
Balls	Pipes
Mauls	Spears
Pendants	



FIG. 18

Face of the ore body, showing sections of the ancient mine openings.



FIG. 19

Heap of stone sledge heads, about 1200 in number, collected on the margin of the mine.

MR. DOUGLASS' REFERENCE TO HEMATITE

“The collection now under consideration closes with a most extensive and varied series of objects in hematite and other iron ores. They number in all about eleven hundred specimens, of which about 1050 are in red hematite, and the balance in the brown hematite and other ores of iron. This is believed to be the largest single collection of hematite objects in the country, and shows conclusively the appreciation of the Indian for beauty of form and symmetry in proportion, and that he spared no labor in expressing this feeling in the hardest and most obdurate material. These specimens appear to radiate from three great centres, viz.: The subdivisions are, the natural nodules or ‘Mineral Lumps,’ the ‘Paint Lumps,’ whose surfaces show evidences of rubbing to obtain the paint so common among the tribes from Florida to the north and west; ‘Balls and Hammer Stones,’ shapes worked from the most obdurate ore; ‘Grooved Axes,’ from an ounce to eight pounds in weight, the largest being exquisitely polished; ‘Celts and Cutters,’ from half an inch to seven inches in length; ‘Grooved Plummets and Sinkers’; a large number of ‘Burnishers’ of very varied shapes, and ‘Pear-shaped Pendants,’ finely proportioned, which may have been ornaments and yet possibly weights for weaving.”*

So far as I can judge by correspondence and examination, the hematite collections arranged according to numbers or size in this country are as follows:

Doctor Whelpley's, that of the Smithsonian Institution, A. E. Douglas' exhibit and American Museum of Natural History, Ohio State Archaeological Society, Phillips Academy, Andover, Missouri Historical Society, Mr. H. M. Braun, East St. Louis, Illinois, Field Museum of Natural History.

There are smaller but important exhibits in the Peabody Museum, Harvard, the Canadian Museum at Ottawa, and elsewhere.

* Bulletin American Museum of Natural History, No. 8, 1896.



FIG. 20

Stone sledge heads, hammers, and rude pick from the ancient galleries. One-third actual size.

Professor William C. Mills, Curator of the museum of the Ohio State Archaeological and Historical Society and the Ohio State University at Columbus, was kind enough to furnish me classification of hematites in his museum. Professor Mills writes as follows:

COLUMBUS, November 3, 1911

"I have your letter of the 30th ult., and I am very happy to comply with your wishes in sending you the number of hematite objects that are on exhibition in the museum. (The number that I give you is not the exact number we have, but only those that are on exhibition). I have estimated the number not on exhibition at about one hundred and twenty-five specimens and those on exhibition three hundred and eighty-one, making a total of something like five hundred specimens of hematite in our museum.

"I took occasion this morning to make an inventory of every case in the museum and I am sending you the results as follows: cones, sixty-one; plummets, eighty-nine; ornaments, six; axes, eight; celts, one hundred and eighty-six; pipes, two; pestle, one, and rubbing stones, twenty-eight. The dark red hematite predominates.

"I have no record of any caches of hematite. I have never found but one hematite piece in a mound and that was a beautiful cone found in a mound at Jackson. All others have been surface finds. The two pipes mentioned are from the Adams collection and are certainly very unique. Practically all of the finds are from the village sites in southern Ohio. I feel that our museum is very short of hematites, compared with our resources. I understand that Dr. Whelpley of St. Louis has perhaps the largest collection of hematites in the world, although the region around St. Louis is specially rich in hematite. We have a good Ohio field and we ought to have a very fine collection of these objects."

WM. C. MILLS

Squier and Davis, in their extensive explorations among the tumuli of Ohio refer to and illustrate hematite objects along with plummets of other materials.

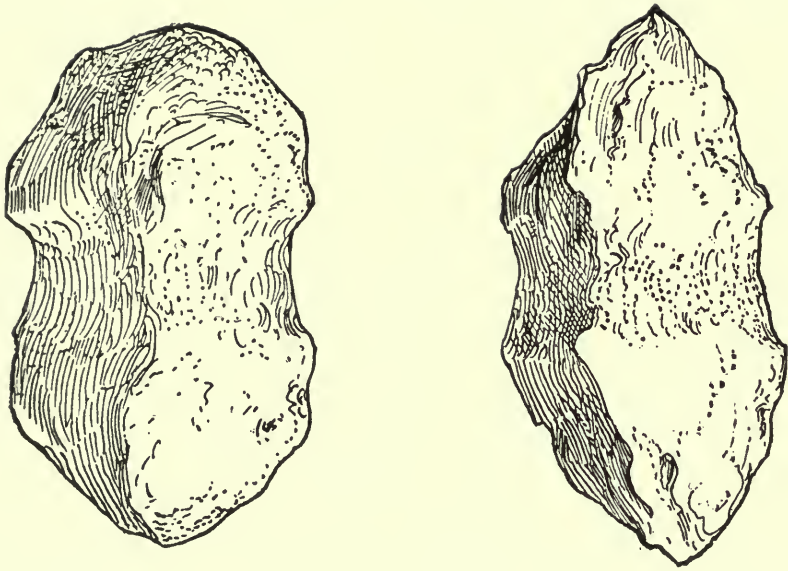


FIG. 21.

Sketches of the rudely shaped mining implements.
(See page 63)

They found hematite plummetts and celts near the mounds, but not in them. Nor were other plummetts to be found in the tumuli.

Referring to the statement by Lawson, in Lawson's Carolina, p. 193:— "Some of the Indians wear great bobs in their ears." Squier and Davis say:—

"We have discovered none of these ornaments in the mounds, and it is difficult to say whether or not they are genuine relics of the mound-builders. It is possible they were used both by the earlier and later races. In the Museum of the East India Society at Salem, Mass., are a number of articles of similar character, which were found while making excavations in that city. They are larger and of much ruder workmanship than those of Ohio, but of the same shape, and grooved in like manner. It has been suggested that those of hematite, which are most numerous, were carried about the person for the purpose of supplying an ornamental paint. Rubbed upon any sharp grit with water, they furnish a dull red pigment,—much inferior, however, to the French preparations for the toilette. Irregular fragments of the same material are sometimes found bearing the marks of frequent trituration. Such may have been the secondary use of some of these articles; the frequent occurrence of those made from other materials establishes that they were primarily designed for other purposes."*

Mr. John W. Wright of Knoxville, Iowa, reports over twenty hematites, all but one of which were found near Knoxville. Eleven are celts, two are axes, one an ornament.

* Ancient Monuments of the Mississippi Valley, p. 235.

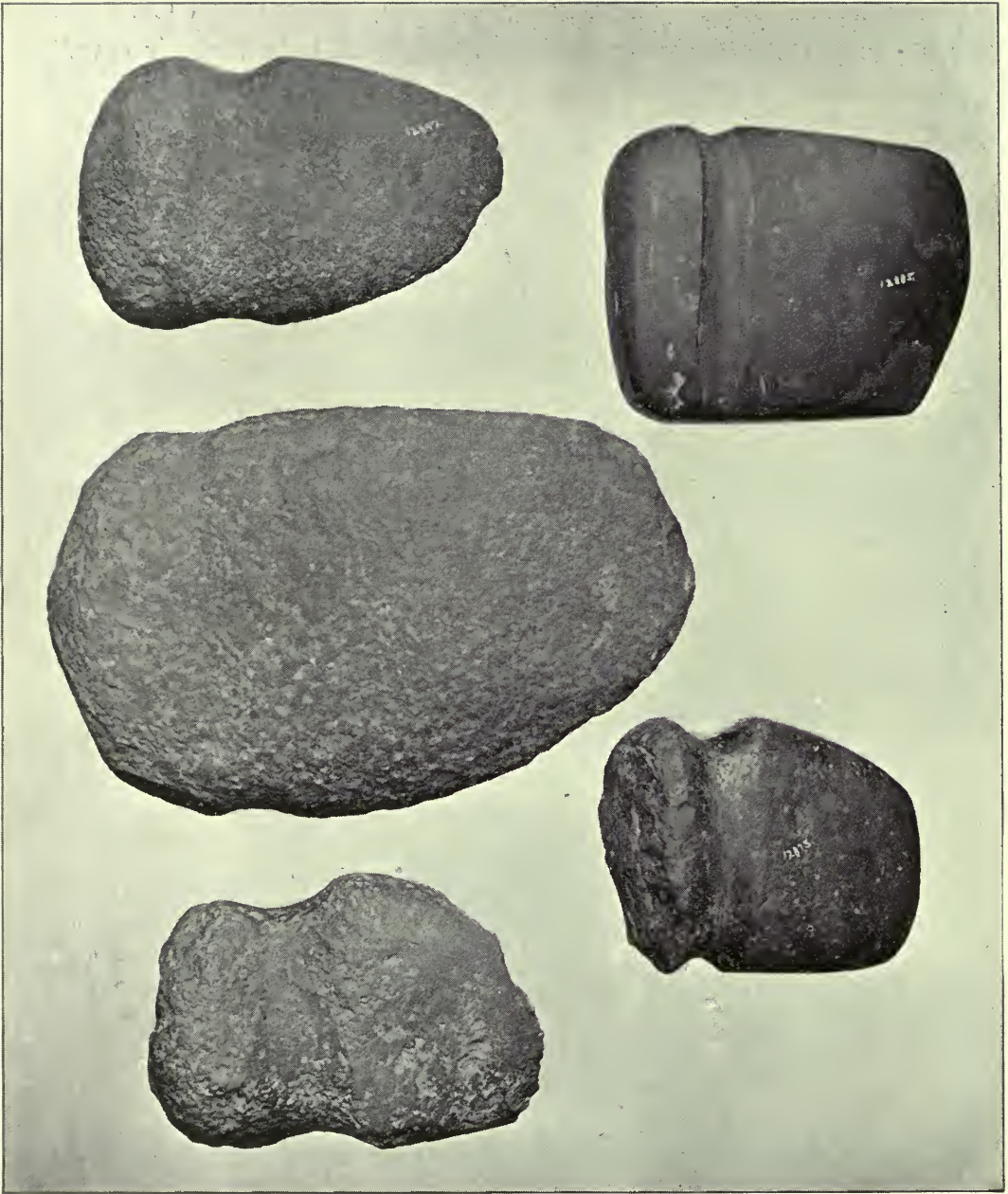


FIG. 22. S. 2-5. ANDOVER COLLECTION

Hematite axes. All from Missouri except one from Ohio. The largest axe is unfinished.



FIG. 23. S. 1-2

Two of the best grooved axes I have ever seen are shown in this figure, from the collection of Mr. Braun, East St. Louis, Illinois. There is one in the National Museum, and one in the New York Museum, each of which weighs over ten pounds, and they are nearly as symmetrical as Mr. Braun's largest one. Dr. Whelpley reports having a beautiful and symmetrical axe from Calhoun Co., Illinois. It is made of hard steel blue hematite and weighs just twelve pounds. See illustration on page 99.



FIG. 24. S. 7-8. ANDOVER COLLECTION

Peculiar notched hematite object found by Mr. E. S. Byington near Dierks, Arkansas. An unusual type. Not pure hematite, but the stone of which it is composed carries a percentage of iron. Both sides are shown.

CHARACTER OF THE IRON ORE

There are several varieties of hematite. And the implements of one section of the country exhibit varying degrees of hardness and variations in color. The percentage of iron also varies. In order to determine these differences accurately, I asked Mr. James C. Graham, head of our Department of Science at Andover, to make me an analysis, as accurate as possible, in his chemical and physical laboratory. Mr. Graham kindly acceded to my request and spent some two weeks in preparing a report based upon careful analyses of some fifteen or twenty fragments of hematite submitted. All of these are broken implements or fragments of hematite which the Indians had not completed into finished forms. Mr. Graham's report here follows.

GENERAL REPORT AS TO ANALYSIS

The specimens submitted for examination vary greatly as to composition, hardness and specific gravity.

SPECIFIC GRAVITY

The specific gravity was determined of the specimen as a whole without regard to its porosity and the included air. This specific gravity would correspond to that of the implement made of such material by the Indians, (which I presume is the point in which you are interested) rather than to the actual specific gravity of the solid matter.

HARDNESS

The hardness varies greatly even in the same specimen owing to the difference in the compactness of the materials. In some cases this has been indicated by the range of hardnesses given. When only one hardness is mentioned, it indicates a fair degree of uniformity.

COMPOSITION

In general the composition is ferric oxide (Fe_2O_3) mixed with more or less silica (SiO_2). The mixture is usually so intimate that after the solution of the iron in acid, a skeleton of the silica of the original form of the specimen remains. In



FIG. 25. S. 5-7

A beautiful hematite axe from the collection of Henry M. Whelpley, St. Louis, Missouri. This was found in central Missouri.

nearly all cases there is a slight amount of water present, though the amounts "combined" and "uncombined" were not determined separately. In the specimens from Union County, Illinois, there seems to be a considerable amount of magnesium (largely as carbonate) especially in the black specimen. This specimen is banded, evidently a vein deposit, and the layers between the bands of hematite were probably largely magnesium carbonate. Probably some of the iron is also in the form of siderite, ferrous carbonate, (Fe CO_3). The amount of magnesium was not determined. It might be between five and ten per cent. I could find no trace of calcium compounds in this specimen.

In the red hematite from Union County, there are large pieces of agate-like quartz, in some cases more than a cubic centimeter in size. The specimen analyzed contained no amygdaloids of any visible size; but even in this specimen the percentage of silica is very high.

JAMES C. GRAHAM

Jan'y 3rd, 1912.

The chemical analyses are herewith submitted. The specimens numbered are from the Andover collection. The localities as follows — 45449, Missouri; 45749, Ohio; 29774, Missouri; 12890, Ohio. The other two specimens presenting the black and red hematite are from Doctor Whelpley's collection.

SPECIMEN 45449, FROM MISSOURI

BLACK HEMATITE, SOMEWHAT CRYSTALLINE

Ferric oxide	98	per cent
Insoluble residue, mostly silicious	1.5	" "
Hardness	5.5	
Specific Gravity	5	

SPECIMEN 45749, FROM OHIO

RED HEMATITE, FINE GRAINED

Ferric oxide	90.4	per cent
Insoluble residue, mostly silicious	7.4	" "
Water, free and combined	1.5	" "
Hardness (varies)	3-5	
Specific Gravity	4.49	

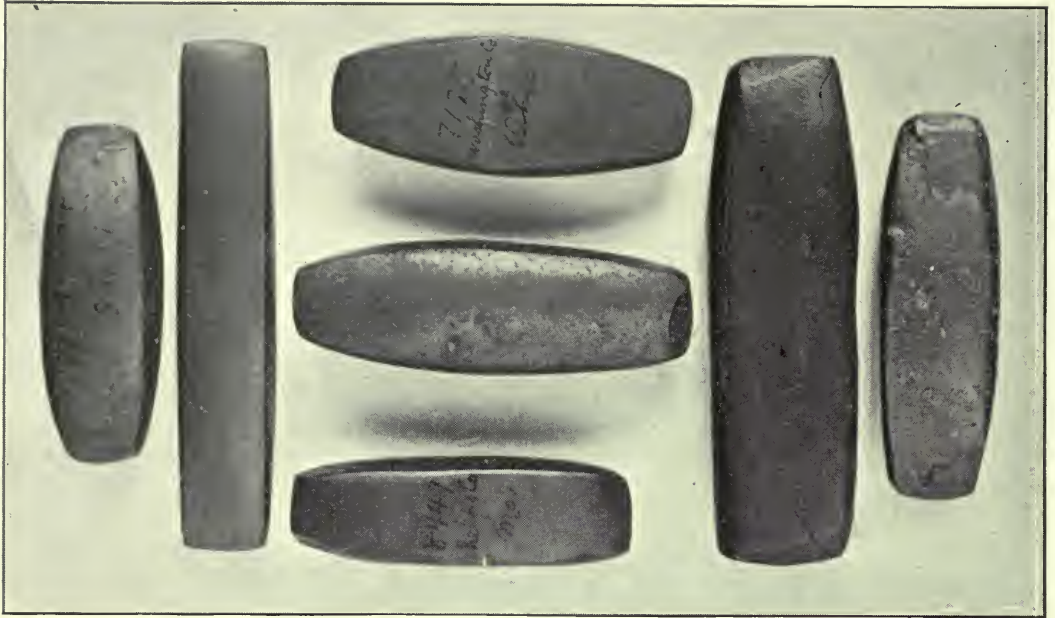


FIG. 26. S. 5-9. H. M. WHELPLEY COLLECTION

Hematite bars. Rare. All but the second from the left are made of very hard black hematite. This one has a shell .06 inch thick of reddish brown, hard hematite covering, and core of yellow ochre. Three are from Missouri, three from Ohio and one from Tennessee. There are numbers of stone implements in the same peculiar form. All of these are highly polished and their use must remain, for the present at least, entirely theoretical. In this collection are other hematite bars not as well finished, and several broken ones.



FIG. 27. S. 15-16. H. M. WHELPLEY COLLECTION

The smallest hematite axe known. It is made of very hard black hematite and was found near De Soto, Jefferson County, Missouri, in an old cultivated field, by J. C. Bowman, in 1893.

SPECIMEN 29774, FROM MISSOURI

BLACK HEMATITE

Granular	
Ferric oxide	98.2 per cent
Insoluble residue, mostly silicious	.65 " "
Water, free and combined	1. " "
Hardness	6
Specific Gravity	4.86

SPECIMEN 45750, FROM OHIO

DARK RED, FINE GRAINED HEMATITE

Ferric oxide	86.4 per cent
Insoluble residue, mostly silicious	11.2 " "
Water, free and combined	2. " "
Hardness	5-6
Specific Gravity	3.84

SPECIMEN 12890, FROM OHIO

FINE GRAINED RED HEMATITE

Ferric oxide	82.6 per cent
Insoluble residue, mostly silicious	13.9 " "
Water, free and combined	3. " "
Hardness	4
Specific Gravity	3.65

UNION COUNTY, ILLINOIS, SPECIMEN (Whelpley)

BLACK HEMATITE, PARTLY CRYSTALLINE

Ferric oxide	84.7 per cent
Insoluble residue, mostly silicious	2.5 " "
Water, magnesia	12. " "
Hardness	5.5
Specific Gravity	3.64

UNION COUNTY, ILLINOIS, SPECIMEN (Whelpley)

FINE GRAINED RED HEMATITE, INCLUDING MUCH QUARTZ

Ferric oxide	51.6 per cent
Insoluble residue, mostly silicious	42.1 " "
Water and traces of other compounds	6. " "
Hardness	4.5
Specific Gravity	2.97

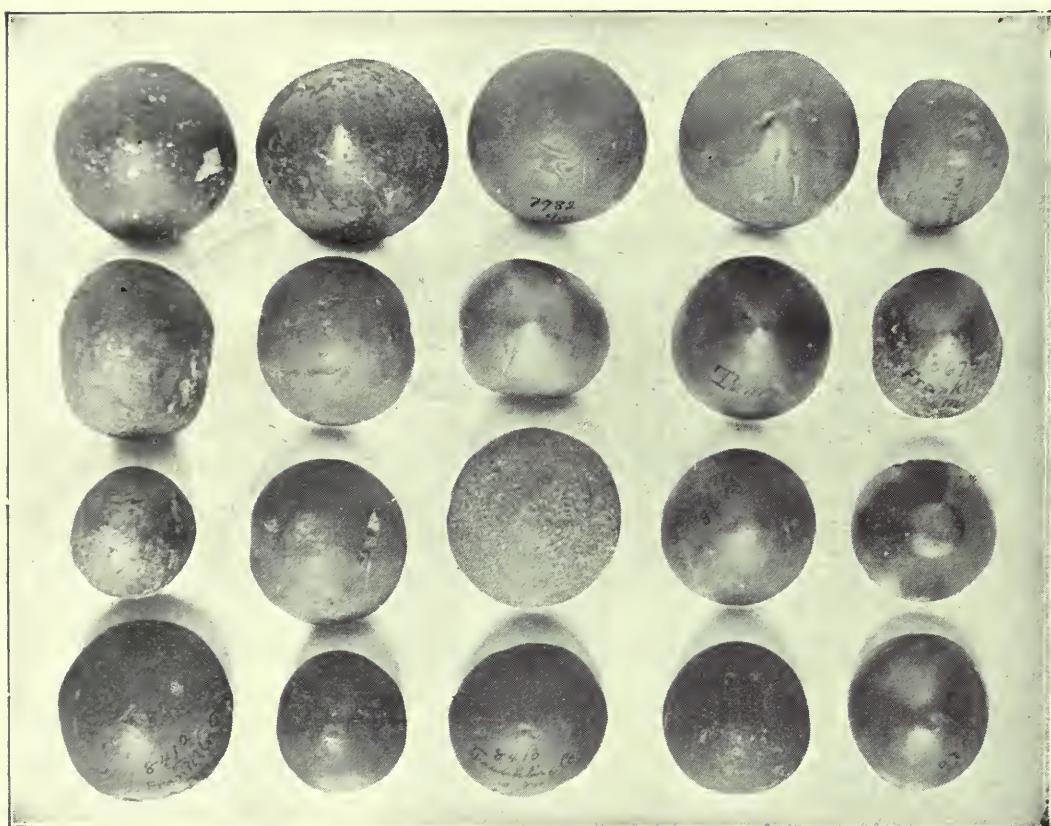


FIG. 28. S. 1-2. H. M. WHELPLEY COLLECTION

Hematite cones. Same form as 8 and 9 of Fig. 2. From Illinois, Missouri, and Arkansas.

THE SOURCES OF HEMATITE

The Handbook of American Indians refers to the fact that most of the hematite made use of by the prehistoric peoples was found on the surface. Doctor Whelpley is of this opinion and I agree with these and other observers. There is no evidence, up to the present, that the Indians mined hematite as they did flint or copper. But they did mine a softer hematite and oxides in order to obtain paint. Iron ore of various kinds occurs generally in the United States and it was no more than natural that the aborigine should pick up various bits of ore that he saw during his travels.

The discovery by Dr. Cox of an Indian paint mine is of great interest. Whether other equally large deposits of hematite were worked to obtain paint, I do not know, although it is quite likely that the Indians visited all the available hematite veins or iron outcrops and procured the valued pigments wherever possible. A tremendous amount of work was done on the estate of Dr. Cox. I say tremendous, advisedly, for it must be borne in mind that it was necessary for the Indians to break through the various layers of stone, remove exceedingly hard bodies of ore by means of very primitive and ineffective tools. Mining by means of a hand drill and black powder is considered laborious and difficult at the present time, much more tedious than the use of the compressed air drill, dynamite and modern machinery. Yet these enterprising aborigines had no tools save rudely notched stone hammers and hammers made of the harder fragments of hematite. That they were able to excavate a considerable number of tunnels and pits in a ridge composed chiefly of iron ore, is remarkable, to say the least.

This paint mine opened by Dr. Cox is set forth by Prof. W. H. Holmes in the Smithsonian Report for 1903. The article should be reproduced here, and Professor Holmes was kind enough to grant permission.



FIG. 29. S. 1-2. H. M. WHELPLEY COLLECTION

Hematite cones. The four upper rows correspond to 4, 5 and 6, Fig. 2. The three lower rows are like 3, Fig. 2.
Localities: Missouri, Illinois and Arkansas.

TRACES OF ABORIGINAL OPERATIONS IN AN IRON MINE NEAR LESLIE, MO.

By W. H. HOLMES

Early in April, 1903, a communication was received by the Bureau of American Ethnology from Dr. S. W. Cox, of Cuba, Mo., stating that evidences of ancient mining operations had been discovered in an iron mine operated by him near Leslie, Franklin County. This report was confirmed by Mr. D. I. Bushnell and other St. Louis archaeologists, and the present writer, who is especially interested in the quarrying and mining industries of the aborigines, repaired at once to Leslie to make a study of the interesting phenomena.

It was found that the miners had encountered a body of iron ore, of unknown depth and horizontal extent, lying immediately beneath the surface of the soil on a gentle slope reaching down to the banks of the Big Creek, a branch of Bourbois River, and that they had removed the ore from a space about 100 feet wide, 150 feet long, and to a depth of from one to five feet, and as the work progressed it was found that the ore had been fairly honeycombed by the ancient people, the passageways extending even below the present floor of the mine, as at the right of the figure in the plate. There were many partially filled galleries, generally narrow and sinuous, but now and then larger openings appeared, two of these being of sufficient dimensions to accommodate standing workmen.

In the debris of the old excavations many rude stone implements were encountered, and upward of 1,000 of these had been gathered by the miners into a heap on the margin of the mine. (See Fig. 19). These sledges are exceedingly rude, consisting of hard masses of stone or hematite weighing from one to five pounds, and roughly grooved or notched from the attachment with the handles, no trace of the latter remaining, however. The great number of these implements made it certain that extensive operations had been carried on by the ancients, but the exact nature of the work was not readily determinable. The first

impression was that the compact masses of hematite were sought for the purpose of manufacturing implements such as were employed by the mound-building tribes in many parts of the Mississippi Valley, but examination revealed few traces of the shaping of this material, save that it had been used in making the rude sledge heads or hammers found in the mine. In breaking up the ore the white miners encountered small, irregular seams and masses of flint, but these were too limited in extent and too brittle in texture to have been utilized successfully in the manufacture of implements. Some workable flint was observed in the vicinity of the ore body, and flakes and rejectage of blade-making, as well as a number of well-finished spearheads, arrow points, and leaf-shaped blades were intermingled in the filling of some of the superficial pits, but this flint-shaping appears to have been an incident only of the work on the site. The evidences of this shaping work are not sufficient to warrant the conclusion that the extensive tunneling was carried on for the purpose of obtaining material for that purpose. Besides, this flint is found in large bodies in many sections of the general region and could readily have been obtained in quantity by the Indians.

It was observed, in approaching the mine, that the exposed surfaces of the ore and the ground about were everywhere a brilliant red. The workmen were red from head to foot, and anyone venturing to handle the ore soon found his hands smeared with red oxide, repeated washing being required to remove it. The prevalence of the red color suggested at once the idea that the site had been an aboriginal paint mine and that the red and yellow oxides were mined and carried away to be used as paint — an article of utmost importance in the aboriginal economy.

As the charges of dynamite used by the miners broke down the walls of the mine it was observed that the deposits were of irregular hardness, that certain portions of the ore were very compact and flinty, containing much quartz, and of dark-bluish or purplish hue, while the larger part was so highly oxidized as to be easily broken up. Extending through the ore body in all directions were pockets and seams of soft red and yellow oxides, and in places there were irregular openings and partially filled cavities. Two of these openings are shown in Fig. 18, a view

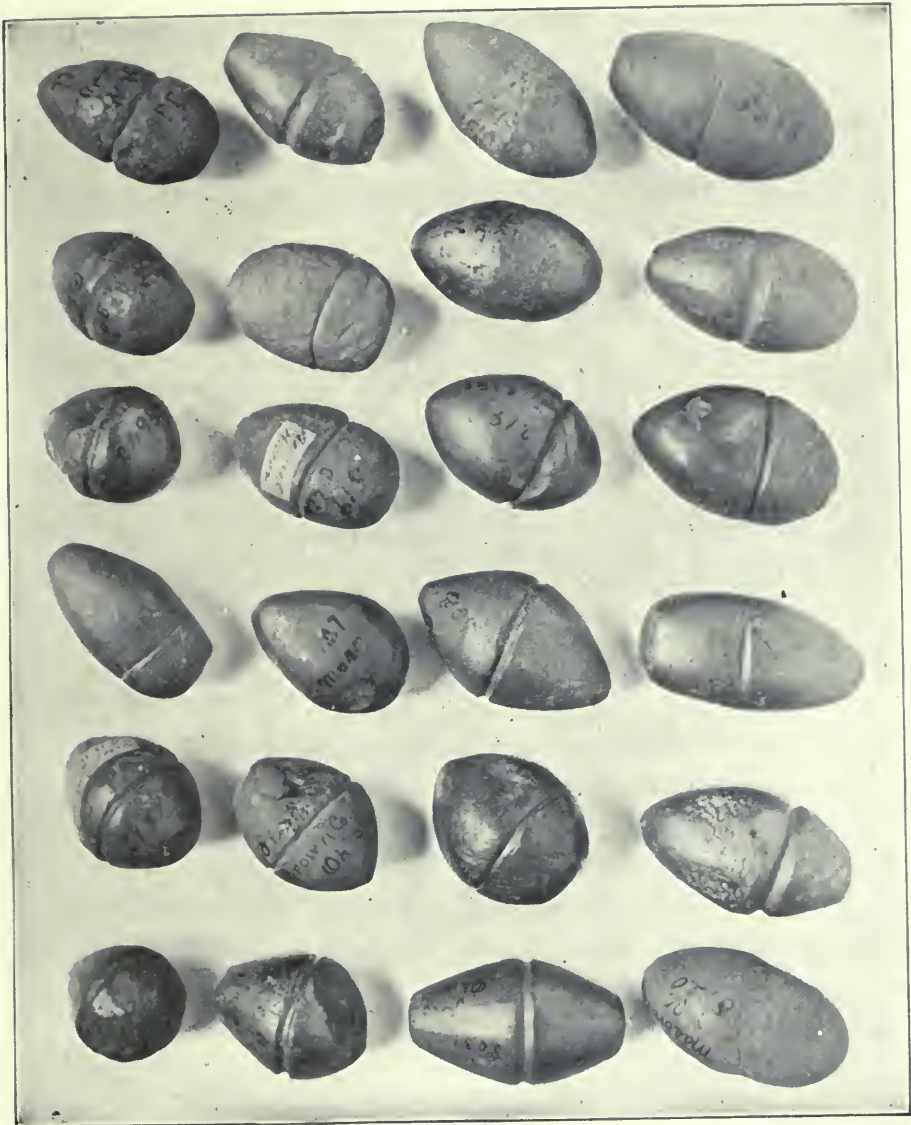


FIG. 30. S. 1-2. H. M. WHELPLEY COLLECTION

Hematite plummets, grooved in the centre. Nearly all are from Ohio.



FIG. 31. S. 1-2

These objects are all from the Andover collection and show the various types of plummets. In the center is a fine plummet of steel gray hematite, very hard. Beneath it, a hematite a trifle softer in which there are some flaws. At the top, an unfinished hematite pecked and ground into shape, but not polished or grooved. On either side of the center, ruder hematite plummets, and at the top, to the left, a grooved hematite object, the groove extending around the longest periphery of the object. To the right is a small plummet, grooved in the centre.

of the face of the mine taken by Mr. Clark McAdams, of St. Louis. The miners would drill with great difficulty through the hardest of ore, to have the drill drop suddenly into a cavity of unknown depth. This occurred at the spot shown in Fig. 16. It was difficult to discover just which of these openings and cavities were artificial, or whether or not they had been penetrated by the ancient workers, as changes are constantly taking place in such ore bodies. Percolating waters fill up or clear out the passageways. Generally, however, as the walls were broken down by our miners the openings were found to connect with the superficial pittings, as indicated in Fig. 17.

It appears certain that the larger tunnels or galleries in which the sledges were found had been opened up or enlarged by the ancient miners and that, in the search of other bodies of the desired product, they had followed weak lines and partially filled passageways, removing the projecting masses of hard ore, where these interfered with the work, by means of the sledges. Sketches of these rude implements are shown in Fig. 21, and the specimens appear on Fig. 20. It is apparent that the sledges could have had no other function than that of crushing and breaking up the solid masses of ore to be used in the manufacture of implements or in opening new passageways through the ore body. (although these sledges were made in the main of compact bits of the ore and of numbers in the copper mines of Lake Superior). Nearly all appear to have been hafted for use, and the majority show the rude grooving or notching necessary for the attachment of the withe haft. It would seem that in the narrow passages of the mine the use of hafted implements would be inconvenient if not entirely impracticable, and we are left to marvel at the feat accomplished by the ancient workmen of penetrating a compact ore body in dark, sinuous passages hardly roomy enough to admit the body of a man, with the aid of rude bits of stone held in the hand. The character of these openings is indicated clearly in Fig. 18, which shows the face of the mine as freshly exposed by the mining operations; and Fig. 17 indicated somewhat imperfectly the manner in which the tunnels or borings penetrate the ore body connecting with the superficial pits and extending to unknown depths beneath the present floor of the mine. Three of

these borings are seen in the wall of the mine shown in Fig. 15. One is exposed at the right of the right-hand figure, and a second occurs beyond this, extending from the stump on the margin of the mine down to and beneath the feet of the man whose back is turned toward the observer, and a third passes down from the second stump, being the same opening as that shown at *dd* in Fig. 17.

Numerous examples of the implements found and specimens of the ore in its various phases, together with a large mass of the compact ore, one surface of which shows the markings of the mining tools of the aborigines, were presented to the U. S. National Museum by the proprietor of the mine, Dr. S. W. Cox.

I have now examined mines and quarries of the aborigines in twelve distinct materials, and each new example has added to my former high estimate of the enterprise and perseverance of the native peoples when engaged in the pursuit of their normal industries.



FIG. 32. S. 5-6. H. M. WHELPLEY COLLECTION

Rare type of perforated plummet. This is a type but as a rule the specimens are not so long but thicker. These objects seem to be peculiar to the St. Louis section of our country, extending up in Illinois beyond Alton. From Hancock County, Illinois.



FIG. 33. S. 6-7. H. M. WHELPLEY COLLECTION

Two rare perforated plummets. These were plowed up together near French Village, a few miles south of East St. Louis, Illinois. These do not constitute a type in hematite, although similar ones of stone have been found.

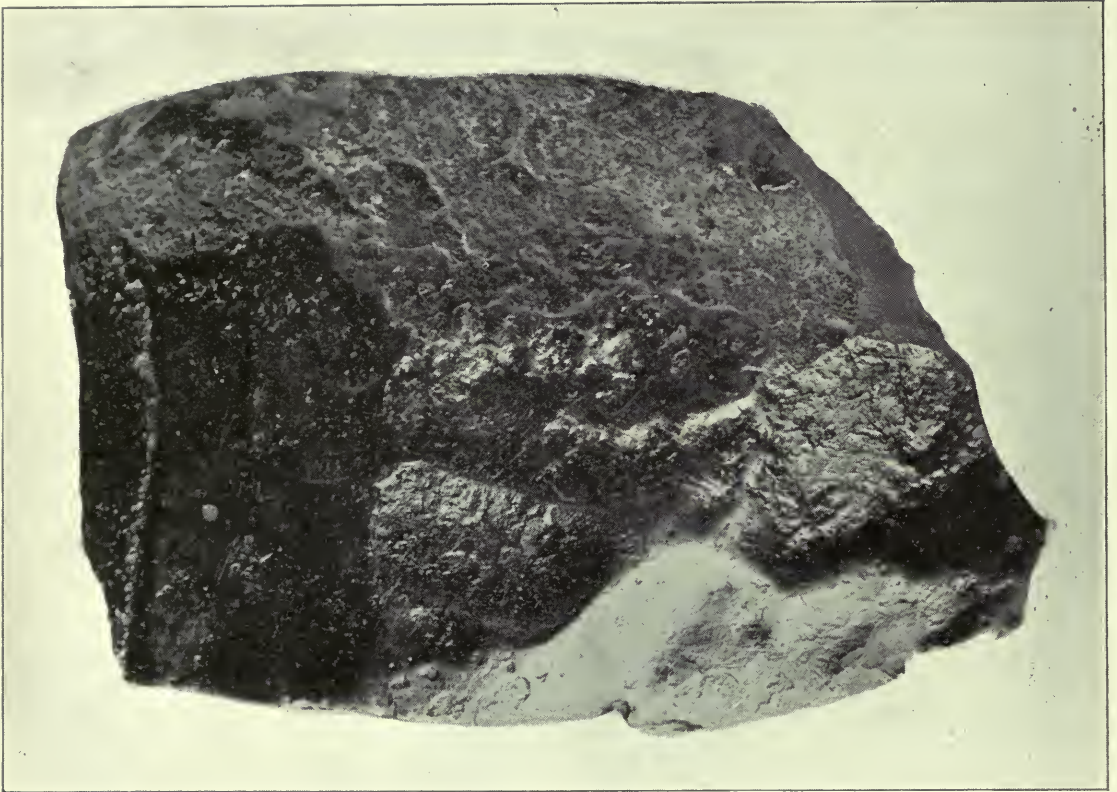


FIG. 34. S. 3-4. H. M. WHELPLEY COLLECTION

Crude piece of hard, black Missouri hematite. This specimen is 3-5 inches thick. The surface is highly polished. It was found in Johnson County, Missouri, together with some very fine, large hematite celts. It is an example of the natural pieces from which celts are made.

A STUDY OF THE OBJECTS

A study of specimens themselves leads one to conclude that the greatest amount of work was put upon the specimens of the finest iron ore independent of their hardness. That is, a specimen because of its lustre, or color, appealed to the Indian and he laboriously worked it out into the desired form. Hardness is a factor to be taken into consideration, for the axes are invariably made of the harder hematite. Usually the finest plummets are of the steel gray or black or very dark red hematite. Mr. Clarence B. Moore sent me a drawing of a most beautiful plummet, graceful and tapering and a trifle over 3 1-2 inches in length which was plowed up near Marksville, Avoyelles Parish, Louisiana. It is of the elongated pear-shape type, similar to one shown in figure 31.

The hematites of Ohio and West Virginia for the most part are somewhat softer than those of Missouri and Illinois. Outside of the heart of the hematite belt only the finer specimens seem to have penetrated. The hematite plummet, or celt in the South or extreme North or West, is usually a fine specimen and was doubtless much prized. But in Ohio, West Virginia, northern Kentucky, Missouri and Illinois there are multitudes of small hematite celts, many unfinished hematite pieces and chunks of hematite so rudely fashioned that we cannot classify them. Whether such crude objects resisted the attempt of the prehistoric artizan or were the product of unskilled workmen is a question. Many such are, doubtless, paint stones. Undoubtedly much of the hematite was too hard for him to work satisfactorily, and he cast it aside just as he cast aside flint or argillite or quartz when he discovered either flaws or exceedingly hard and refractory sections in the stone.

Mr. Douglas has referred to the presence of paint hematite generally in the United States. It seems to me that we should recognize the difference between ordinary soft hematite, or oxides of iron, which the natives regarded of value because from them they obtained paint, and the true hematite. Next to the celts, described on page 71, we have the large class of plummet-shaped objects and the hemispheres and cones. The axes may be con-



FIG. 35. S. 6-11. H. M. WHELPLEY COLLECTION

Crude Hematite. This is a very peculiar piece of high grade ore, wonderfully polished, found by a pearl fisherman in the Illinois river near Ottawa, Illinois.

sidered to occupy a limited area, the center of which is not far north or northwest from St. Louis, Mo.

One of the surprising things to me with reference to hematites is that they do not seem to have been objects of commerce to the extent of sea-shells, copper and mica. The Florida and Carolina tribes seemed to have sent large numbers of sea-shells into the Ohio valley. It would appear that copper was carried from the Great Lakes region into the far South — that is, supposing that copper in use along the gulf and southern Atlantic seaboard was not obtained from local sources. But hematite south of Tennessee is quite rare and it is not at all common in the Great Lakes region, Pennsylvania, or New York. Yet it was thought to be valuable for the reason that the few hematite objects found in the South, or the East, or outside of the localities where iron ore was obtained, are always of the finest workmanship.

We must consider the grooved axes as local; the tablets, ornaments and winged forms as local. The other forms are more or less widespread, but not general, and the celt and the rubbing stone alone as very widely distributed through the entire hematite belt.

The triangular pieces of hematite, the irregular fragments which show evidence of working are general throughout the Ohio valley and it cannot be said that they are more numerous in Missouri than in West Virginia.

The few hematite discoidals, or bicaves, and the one or two hematite ornaments found in the Ohio valley may have been imported from Missouri where greater numbers occur, but I think that they are local and independent of any influence on the part of the Missouri artizans.

Why more hematite plummets, hemispheres and cones are not found with skeletons in the Ohio valley must remain an enigma, unless the suggestion is true that the use of hematite in the Ohio valley preceded the building of mounds and the making of stone graves. This opens a new and interesting line of thought.



FIG. 36. S. 7-9. H. M. WHELPLEY COLLECTION

Unfinished hematite plummets in the rough, showing two stages in process of manufacture from nodule or chunk of ore to the finished object; made from hard, black Missouri hematite. In this collection can be found a dozen specimens showing each stage from the untouched chunk of ore to the highly polished and finished plummet.

THE CELTS

From the very nature of hematite, it being heavy, large objects in this material would not be expected. And it is true that the natives did not work large fragments of the ore. That is, they may have broken up large pieces, but none of the grooved axes or celts are to be compared in size with similar stone tools common in the Ohio valley.

The classification of celts, found upon page 19, gives one a fair idea of the range of these implements, which is considerable.

Not only are they oval with sloping faces, but also they are flat, they are beveled, and in some of them one side is flat and the other convex. The edge may be straight, or curved or sloping. The top or poll pointed, rounded, square or angular. They pass through quite as extensive a range in form as do the stone celts, yet, I have never seen a large hematite celt. Dr. Whelpley has a few larger than those on exhibition in most museums, but these are strays and do not establish a type and they are not large in the sense that stone celts are large. Few celts are over four inches in length. I never heard of one eight inches long.

Quite likely, as Professor Holmes has indicated in his article in the Handbook of American Indians, small celts served as amulets and charms, or were part of the shaman's outfit. To people knowing nothing beyond stone-age culture even the red or brown iron-ore celts must have been objects of veneration.

The very small celts — one half to one and a half inches in length — may have belonged to the "problematical" class referred to above. It is difficult to assign them a purpose as utility tools of the ordinary sort.

The uses of the celts are probably similar to uses of the small polished stone hatchets. They are of convenient size to be mounted in wooden or bone handles and employed to dress skins and hides. Those three to four inches long might have served as small war hatchets, for properly mounted they would form weapons not to be despised. The edge of the iron-ore celt is harder, and it seems to me less liable to become chipped or broken, and susceptible of greater keenness, when ground. Dr.

Whelpley thinks that the edge of hematite celts was more liable to chip. Hematite blades might have been inserted in the more prized war-hatchets. We cannot conceive that hematite celts always played a menial part. In fact, it is my opinion that they were considered above the average celt of ordinary rocks, and even of hard materials such as granite or greenstone.

The surprising number of very small and highly polished celts indicates that these were used until the object was worn down to exceedingly small proportions. How that this wearing is observed to be symmetrical—all proportions being reduced equally—is indication that great care was exercised in the use, or the care, or the refashioning of the implement. No such care is to be observed in the treatment of stone axes or celts of ordinary materials. They may be worn until the blade is greatly shortened, and the top or poll is out of all proportion to the edge. Dr. Whelpley thinks the fine, very small celts were “born” small. He has studied a number of them and refers to those from one-half to one inch long.

NOTE.—Since writing this article on celts, Dr. Whelpley reports that he has a few celts about six inches long.



FIG. 37. S. 3-4. H. M. WHELPLEY COLLECTION

Rare chipped hematite discs of hard black hematite. Upper discs from Callaway and Franklin Counties, Missouri, lower ones from Virginia and Callaway Counties, Missouri. Their purpose is unknown. They resemble the flint discs of Tennessee. The one in the lower right-hand corner has been ground.



FIG. 38. S. 1-2. H. M. WHELPLEY COLLECTION

Three stages of manufacture, from the pecked nodule to the finished hematite axe, are shown in this figure. The material is hard, black hematite. The central object shows attempt at cutting the groove. Doctor Whelpley has in his collection a series of a dozen pieces extending from the untouched hematite nodule through the broken, chipped, pecked, ground and polished stages to the finished axe.

THE PLUMMET AND ALLIED FORMS*

There are many of these. Some are grooved at the top, others about one-third of the distance from the top, and some there are which are grooved around the center. Plummetts for the most part are rounded, but ones flat on one side are not unknown.

After much study of plummetts finished and unfinished, I am not prepared to offer an explanation for their use. The general theory that they were suspended by means of a string tied around the groove, and worn as charms, etc., may or may not be correct. It does not appeal to me. Theoretically, I consider the groove too shallow or narrow to admit of securing them safely by means of a string — that is, if worn. Because of the weight of the object, and its highly polished surface, and its roundness, it would swing back and forth and be rather unsatisfactory as a suspended ornament. That the groove was for some special purpose, no one will deny. Perhaps the groove was not intended that the plummet might be suspended, but that something might be tied to the object — or vice versa.

Great care was manifested in working these hard iron-ore fragments into tapering plummetts. It was not as easy task. What special significance the plummetts carry, we do not know. Cones and celts and bits of paint are found with the burials, but the plummetts in graves or mounds are exceedingly rare.

* A paper on plummetts in general was written by Dr. Charles Peabody, and published in the *University of Pennsylvania Bulletin*, Series, 1901.



FIG. 39. S. 1-3. H. M. WHELPLEY COLLECTION

Very rare hematite roller pestles. These are rare in Missouri in ordinary stone. That they should have been made of hematite seems surprising. Possibly they were for use in preparing sacred meal to be used in the ceremonies. Both specimens show great age. Doctor Whelpley has another similar hematite pestle found in Michigan.

CONES AND HEMISPHERES

Professor Holmes wrote concerning these in the Handbook of American Indians, and I quote his remarks.

“HEMISPHERES, SPHERES. Small objects usually of polished stone, the use of which has not been fully determined; they are therefore classed with problematic objects. The more typical forms, found in the mounds, are often of hematite and, like the cones, rarely exceed a few ounces in weight. Hemispheres are comparatively numerous, but spheres referable to this group are rare. Hammerstones and stones used as club-heads (see Clubs, Hammers) are often spherical, but usually they are not well finished, and occasionally large cannonball-like stones are found which cannot be properly classed with the smaller polished objects. The base of the hemisphere is flat, rarely slightly hollowed out, and varies from a circle to a decided ellipse, while the vertical section departs considerably from a true semicircle. Typical objects of this group are most plentiful in the middle Ohio valley. It is surmised that they served in playing some game, as talismans or charms, or for some special shamanistic purpose.”

The collection of hematites at Andover, numbering all told 292 specimens, and set forth in the table on page 78, indicates the correctness of the observations made in this BULLETIN. The same is true of the collections made by Mr. A. E. Douglas for the American Museum of Natural History, New York. I visited the Peabody Museum, Harvard University, recently and found further confirmation of the general statement that the heart of the hematite belt is West Virginia, southern Ohio, northern Kentucky and Missouri and western Illinois.

The number of hematite objects in the Smithsonian cannot be ascertained, although it must be very considerable.



FIG. 40. S. about 4-5. H. M. WHELPLEY COLLECTION

Hematite bell pestle. Made of hard red "kidney" hematite. Floyd County, Indiana. This shows great age and much handling but does not indicate use as an ordinary pestle. In this collection are other specimens from Kentucky, Missouri and Ohio.

ORNAMENTS AND UNKNOWN FORMS

It is only natural that the material so highly prized by the natives as we suppose iron ore was, would be used for more than common purposes. There are found in Missouri, Illinois, portions of Kentucky and Ohio not a few ornaments, tablets, and other forms of this material. In the Douglas collection at New York, we have seen that there are 34 of these and in Doctor Whelpley's exhibit there are many more.

There are sufficient of these rare forms to constitute a type but so few of the winged objects have been found that it is not thought necessary to classify them.

The numbers in the Whelpley and Douglas collections might lead some persons to question the genuineness of some of these very unusual forms in hematite. But it must be borne in mind that these two large exhibits would naturally include unusual as well as common forms, and the proportion of unusual forms being similar in both exhibits, and each the property of a discriminating collector, it is safe to assume that all the specimens are beyond question genuine.

The tablets are of the ordinary flat perforated type following the slate, sand-stone and shale tablets in outline. There is nothing especially remarkable in the form, the chief difference lies in the fact that different and hard material is used.

Effigies are exceedingly rare and there are but one or two in existence. Fig. 47 presents a hematite carving, supposedly of a fish, from the Whelpley collection.

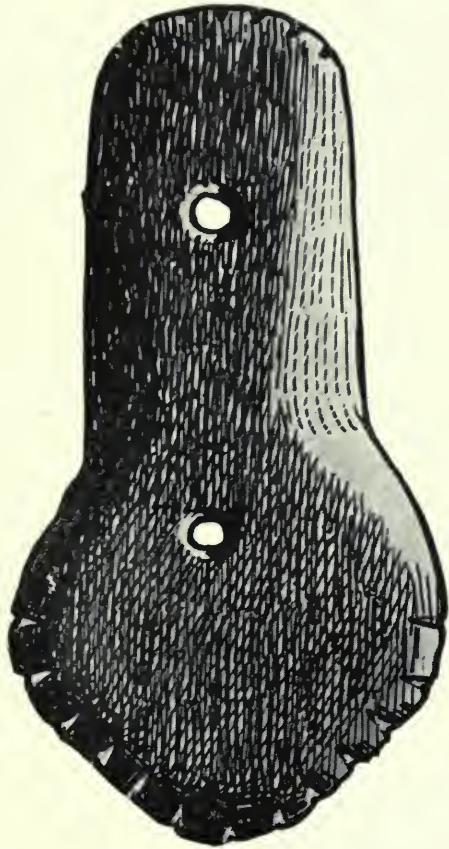


FIG. 41. S. 1-1. HEMATITE ORNAMENT. Andover Collection.

It is remarkable in that both ends are decorated with notches. On the upper end there are eleven notches or incised lines; on the lower or broad end there are fourteen lines. This specimen is not a type but an anomaly. It is of heavy, pure hematite and not of stone discolored by iron oxide as are many of the ornaments. It was extremely difficult to work because of the density and hardness of the material. Aside from these facts this form is peculiar. The edges are slightly beveled. The specimen shows unmistakable evidence of antiquity because of the patina, and the cuttings (striae) are irregular and have been made of flint and not with steel. Ross County, Ohio.



FIG. 42. S. 3-4. ANDOVER COLLECTION

Bicaves and decorated objects. Three from Ohio, one from West Virginia, one from Missouri. At the top is a long, unfinished ornament. No. 29941 may be an effigy.

DISCOIDALS OR BICAVES

These are found occasionally but not in sufficient numbers to be considered general. Yet the type is practically the same as the type in granite, quartzite or Tennessee marble common throughout the Middle-south.

If a discoidal of quartzite, granite or quartz was considered a work of stone-age art in the eyes of the aborigines, how precious must he have thought these bicaves of hematite to have been! And the same is true of the ornaments. If he, after much labor, was able to work out of the hard, black or dark red hematite an ornament, he might well be envied by all the other Indians of his particular tribe. It is just possible that these hematite ornaments and bicaves were not for use but rather a part of the sacred mysteries of the tribe. As to that we may never know. We may assume such to be true since objects requiring far less skill and labor in their manufacture are to this day regarded as mysteries among the various Pueblos of the Southwest. And it has often occurred to me that many of these problematical forms whether in slate or granite were of as great significance or value to stone-age man as are many of the charms and effigies among the Pueblos at the present time. But the difference is that we have the Pueblo with us and can construct their life easily, whereas in studying these stone-age people we depend on archaeological testimony alone.

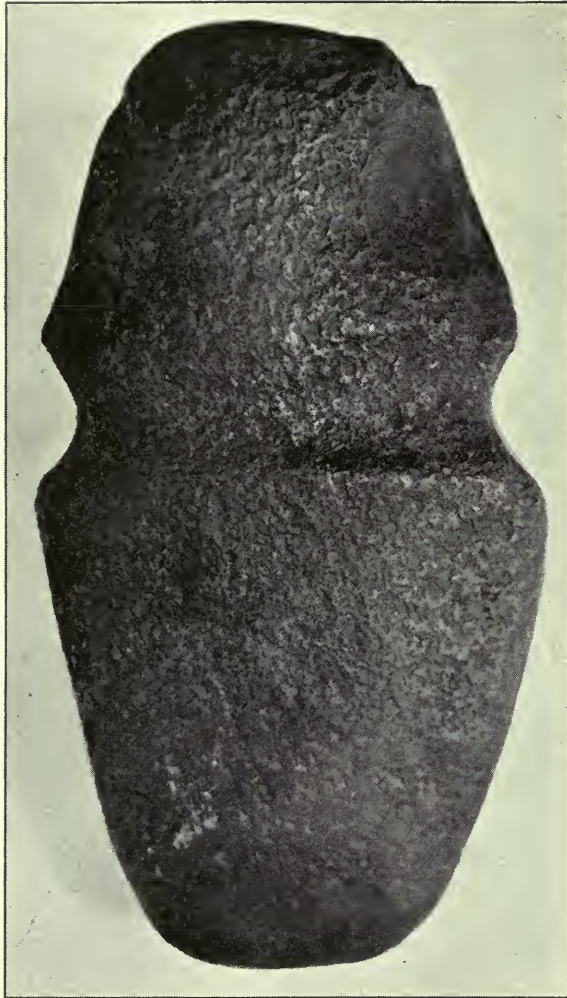


FIG. 43. S. 2-3. H. M. WHELPLEY COLLECTION

Rare hematite axe which seems to be double-bitted, with one blade unfinished; made of hard, black hematite. From Cole County, Missouri.

UNIQUE FORMS IN HEMATITE

Figure 37 illustrates four hematite discs from Missouri. Two in the upper row are not unlike the carefully chipped flint discs of Tennessee, described and illustrated in "The Stone Age in North America," pages 162-175. The purpose of these discs must remain problematical, but I would venture the opinion that they are not unfinished. They were made for some special purpose. What purpose, it is impossible to determine.

In Figure 39 are shown two objects of the roller pestle type and in Figure 40 a bell-shaped pestle. I do not believe pestles intended for ordinary, everyday use were made of this refractory material. Whether the three pestles illustrated were for grinding sacred meal or made use of in the ceremonies of the tribe in preparation of sacred food are questions we cannot answer. Theoretically, I am inclined to that opinion.

In Figure 42 there is shown a roughly shaped hematite effigy, museum number 29, 941. Also a bit of hematite decorated. The discoidals in the center of this figure are particularly fine.

In Figure 46 at the bottom of the illustration is a curious celt-like hematite of unusual form. I have seen very few hematites of this particular type. It appears to be much weathered and of concretionary formation. The same is true of the cone in the same figure. Objects of concretionary hematite are occasionally discovered.

Figure 50 presents a curious hematite hollow ball rattle perforated so that it can be suspended without danger of loss.

In Figure 51 there are a number of gorgets precisely similar to the gorgets in slate and shale. Number 8379 is peculiar in that the edges are serrated and notched.

The drilling in Fig. 52 is remarkable. We can readily conceive that the Indian was able to cut and polish hematite, but that he could drill it satisfactorily with his primitive drilling apparatus speaks very well for his ability as a worker in stone.

Mr. E. Ralston Goldsboro of Frederick, Md., owns a small hematite mortar from a site near the Lehigh river.

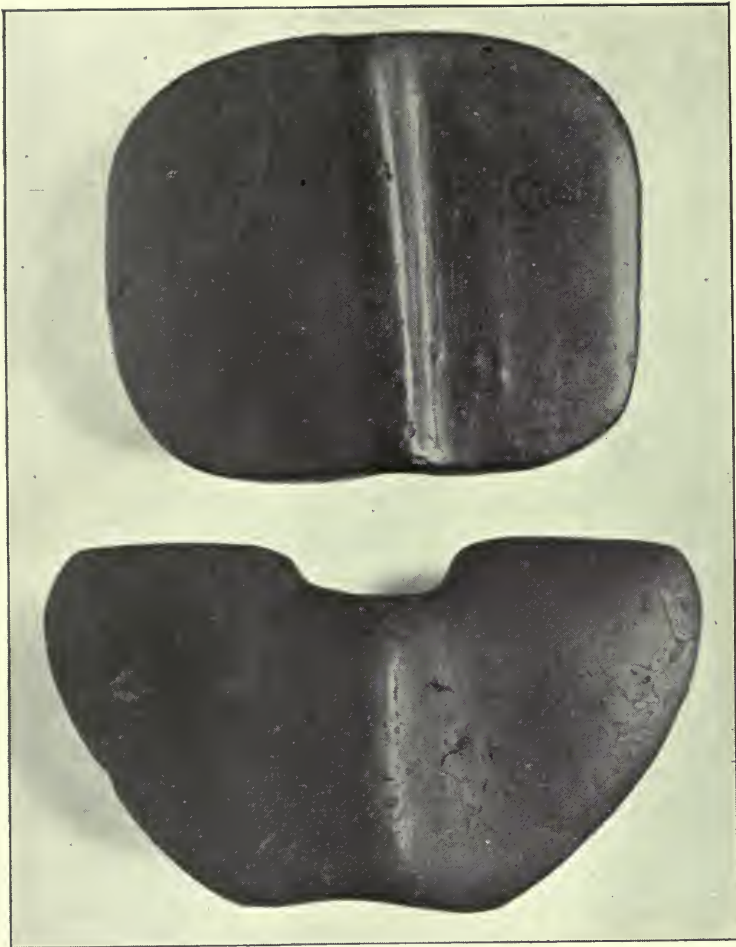


FIG. 44. S. 2-3. H. M. WHELPLEY COLLECTION

Rare hematite ceremonials. The upper one is brownish red. Found in Milton County, Georgia. The lower one is made of hard, black, concretionary hematite; from Franklin County, Missouri.

COMPARISON OF COPPER AND HEMATITE

Where the hematite occurs most frequently, the same peculiarity is observed as in Wisconsin and Michigan where great quantities of copper were either mined or found in the form of nuggets by the Indians. That is, hematite axes abound in certain sections of Missouri. Here there was in evidence much surface hematite, as Dr. Whelpley has stated. In the copper region of the Great Lakes quantities of copper gouges, fishhooks and other implements occur. In Ohio where much copper has been taken from the prehistoric mounds and in the South the gouges and the fishhooks are absent. So it is with the hematite. With rare exceptions, axes of iron ore do not occur in Ohio and Kentucky. The material was considered too valuable to be made into objects of general utility. This is significant in the matter of hematites as in the case of the copper tools. The farther away from the source of supply, the more valuable the material. The same is also true of the great shells found along the Florida and South Carolina coast. These when brought into distant villages either become dippers or cups, shell ornaments, etc. Where they were exceedingly common along the coast, the natives made of them not only hoes but club heads and implements of general utility.

Thus we see that where material of a certain kind predominates it is used for a variety of purposes. One would not expect to find hammers or sledges made of hematite save where that ore occurred in almost inexhaustible quantities. Dr. Whelpley's mauls and sledges and similar objects are from Missouri.



FIG. 45. S. 2-3. H. M. WHELPLEY COLLECTION

Rare hematite pendants of very hard reddish hematite. The one to the left is from Drake County, Ohio, the other from St. Francois County, Missouri.

CONCLUSIONS AS TO HEMATITES

It has never seemed to me that the prehistoric Indian regarded hematite in the same light as he did other stones. We must remember that he was a man of the stone age, knowing nothing of our present day culture. Things that would be cast aside by us or considered of no importance were precious to him, things that we considered ordinary were to him mysteries. We may assume that shortly after his arrival in America he found fragments of iron ore. He was accustomed to handling stone and he knew at once that this was no common material. It was different in color and it was heavier than other stones. It did not chip readily and when he tried to reduce it to desired shape by grinding he must needs work many and laborious hours. That he could chip hematite is evident, but he preferred the other process. Dr. Whelpley has many chipped hematites, but such are not general elsewhere in the United States. Yet when he had finished his work and had polished the celt, the axe, or the plummet, he found himself possessed of an implement or ornament of a mysterious material, material which must have appealed to those natives with whom he traded and who lived at a distance, as something above price. There is no stone like the hematite. It is susceptible of a high and beautiful polish. Its color, whether dark or light, is rich and beautiful. Truly it was a medicine or a mystery stone.

Regarding the hematites found with skeletons in mounds or graves, there are some significant facts to be observed. In poor or small mounds and stone heaps in the Ohio valley which I have explored I have frequently found rude flint implements, occasionally a fairly worked and polished slate gorget. This culture Prof. Mills gave the name of Fort Ancient culture to differentiate it from the Hopewell culture. The latter represents the finer arts of the more prosperous tribes living in the broad river valleys in Ohio. One never hears of the rude stone celt, the pestle, or the grooved stone axes being found with the burials in the mounds of the Hopewell culture. Why is hematite not found in the



FIG. 46. S. 3-4. H. M. WHELPLEY COLLECTION

Hematite Indian artifacts showing chemical change in composition of either the outer surface or inner portion since they were manufactured. Note three grades of material in celt to the left. Surface of cone is the hardest kind of black hematite. The inner portion is medium hard brown iron ore. Numbers of weathered hematites are in this collection.



FIG. 47. S. 2-3 H. M. WHELPLEY COLLECTION

Hematite fish effigy, made of a very fine quality of hard black hematite. This object is difficult to explain. Only one side shows an eye and gill and both of these organs are due to depressions in the piece of crude hematite from which the celt-like object is made. Possibly a white man saw his opportunity and made the mouth. It is an interesting study. From Cole Camp, Betnon County, Missouri.



FIG. 48. S. 2-3. H. M. WHELPLEY COLLECTION

Hematite spear made from hard black hematite. The side shown is not as well chipped as the other side. The specimen shows much handling. Found in San Luis Obispo County, California. Doctor Whelpley has other hematite spears but only one of hard black hematite.

altar of "high-culture group" mounds? Possibly the Mound-building peoples did not make it into plummets or celts. Certainly, the Hopewell culture people were skilled artisans in the working of quartz crystals, copper and occasionally meteoric iron fragments. Therefore, the hardness of hematite did not present an unsurmountable obstacle to the lithologist.

In my book, "Primitive Man in Ohio," published 1892, I have referred in detail to many explorations. If readers will consult the references cited on the next page in this BULLETIN, they will observe that hematites have been found either in small mounds in valleys or in the hill mounds. And these mounds do not appear to be of the Hopewell culture. But during the exploration of the Hopewell site, we found no hematite, if my memory serves me correctly. And this site, as has been frequently stated, evinced the highest culture of and prehistoric people north of Mexico, with the possible exception of the Chaco Group of ruined pueblos in New Mexico.

It would seem to me, after due study and consideration, that the hematites were in use previous to the occupation of the great mound groups of the Ohio valley. In other words, that they are not of the Hopewell culture, but earlier. In this statement I may be in error, but up to the present all the facts indicate the truth of such an observation.

Squier and Davis' observations as to hematite plummets in the altar mounds (see page 47) bear out my contentions.

Some hematites have been found in the gravel or glacial kame burials. I have alluded elsewhere to these peculiar burials found in gravel knolls throughout Ohio and Indiana and have considered them somewhat different from either the Hopewell or Fort Ancient culture.* Such hematites as have been reported to me, or found by me, or regarding which I have read in reports as coming from these gravel knolls are for the most part the celts. They seem, possibly, older than the hematites from the mounds.

Both Mr. Braun and Dr. Whelpley, living as they do in the very heart of the hematite belt, in the United States, have special advantages or opportunities for observation. Therefore,

*The Putnam Anniversary Volume. Boston, 1909, p. 142.

I have accepted their statements fully. Their observations indicated precisely what a study of the museum collections leads one to believe. That is, the wide distribution of the celt, which undoubtedly is the most common implement of iron ore in the United States. The celt may have occurred to the aborigine who was seeking after paint and who in rubbing a fairly soft bit of hematite produced an edge and found that the edged tool was quite as convenient and certainly would last longer than the ordinary stone celt.

The plummet and the cone, while widely distributed, cover no such area as the celt. The bits of hematite used as paint or rubbing stones are quite as widely distributed as the celt. The axes are confined to a narrow belt in Missouri with here and there exceptions in Illinois, Kentucky or Ohio. The ornaments predominate in the region within 150 miles of St. Louis. The few arrow points or spear-heads made of hematite might be considered either as freaks or as implements made for some particular shamanistic purpose. The tablets and the winged objects are confined to a restricted area. A complete tabulation of all the hematites in both public and private collections in the United States might add to our knowledge of these interesting things and peculiar examples of prehistoric art.

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- P. 23, Chapter 3. Hematite spherical object with decayed skeleton. Mound in Muskingum valley, near Marietta.
- P. 25, Chapter 3. A worked hematite object similar to a cylinder, was found in a hill mound near the mouth of the Muskingum river, Ohio, previous to 1890. Three skeletons were taken from this tumulus.
- P. 27, Chapter 3. "It is very singular that hematite should have been used so largely by the aborigines of the Muskingum valley for fashioning implements, when tribes of the Miami or Scioto regions used it only to a limited extent. Mr. Davis reports finding a highly polished hematite celt and cone and fragments of hematite in a tumulus upon the same terrace as the altar mound."
- P. 148, Chapter 12. Mound No. 36, three miles from Chillicothe, Ross County, on the east side of the Scioto—a hematite celt with skeleton.
- P. 161, Chapter 13. Mound near Slate Mills, Ross County,—a fine hematite cone near the left hand of a skeleton.

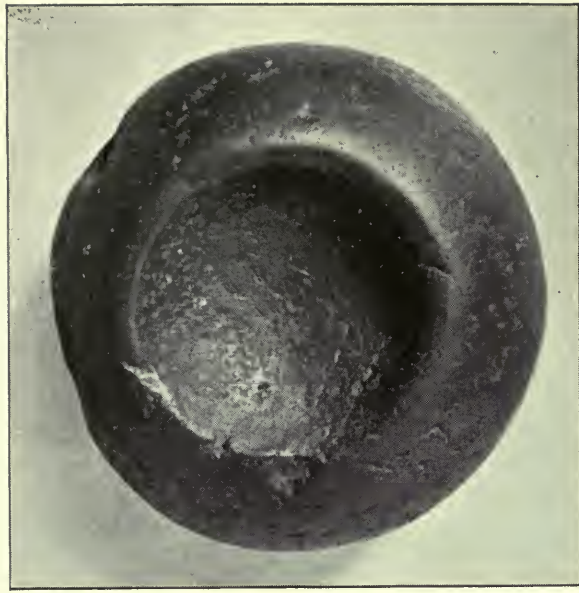


FIG. 49. S. 2-3. H. M. WHELPLEY COLLECTION

Black hematite discoidal. Doctor Whelpley has a more highly polished bicave than this one, but because of the exceedingly glossy surface, no satisfactory photographs can be taken.



FIG. 50. S. 7-8. H. M. WHELPLEY COLLECTION

Hematite rattle, extremely rare. Made from a very hard black hollow hematite nodule. This contains hematite pieces evidently introduced through the holes but of such shapes that they do not readily fall out. The shell is about .20 inch thick, showing evidence of long use. From Ouachita County, Arkansas.

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FIG. 51. S. about 1-3. H. M. WHELPLEY COLLECTION

Hematite gorgets. Rare. These are of very hard black or hard red hematite. Those not labeled are from Missouri. Doctor Whelpley states: "I have several broken hematite gorgets. They are nearly all from Missouri and Illinois. I know of two very hard black hematite gorgets, found in Illinois."

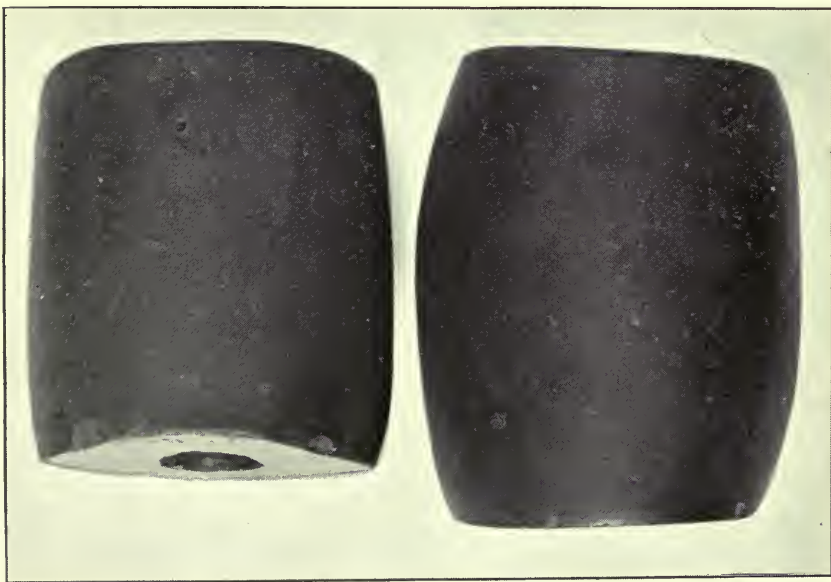


FIG. 52. S. 4-5. H. M. WHELPLEY COLLECTION

Very hard reddish brown hematite beads. Both show much handling and the one to the left appears to be of great age.

Moorehead, W. K.

"Primitive Man in Ohio," 1892. Chapters 3, 12, 13.

"Prehistoric Implements," 1900, pp. 128, 132-5, 182, 337,

H. celts, ornaments, cones, plummet, paint stone.

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FIG. 53. S. about 1-5

Group of hematite objects from the collection of Dr. W. C. Barnard, Seneca, Mo.

Top row; black, oval club head.

Next row: double grooved, highly polished plummet, an axe grooved three-fourths of the way around, back flat; discoidal, also slightly grooved around the circumference.

Central row; six fine, grooved axes and a large ungrooved plummet-shaped object.

Lower row; grooved axe, two perforated winged objects and a small paint pestle or muller.

Nearly all of the specimens are from St. Charles, Montgomery, Lincoln and Callaway Counties, Missouri.



FIG. 54. S. 1-2. H. M. WHELPLEY COLLECTION

Highly polished grooved hematite axe. A fine specimen of perfection in workmanship. Weight, 12 pounds.

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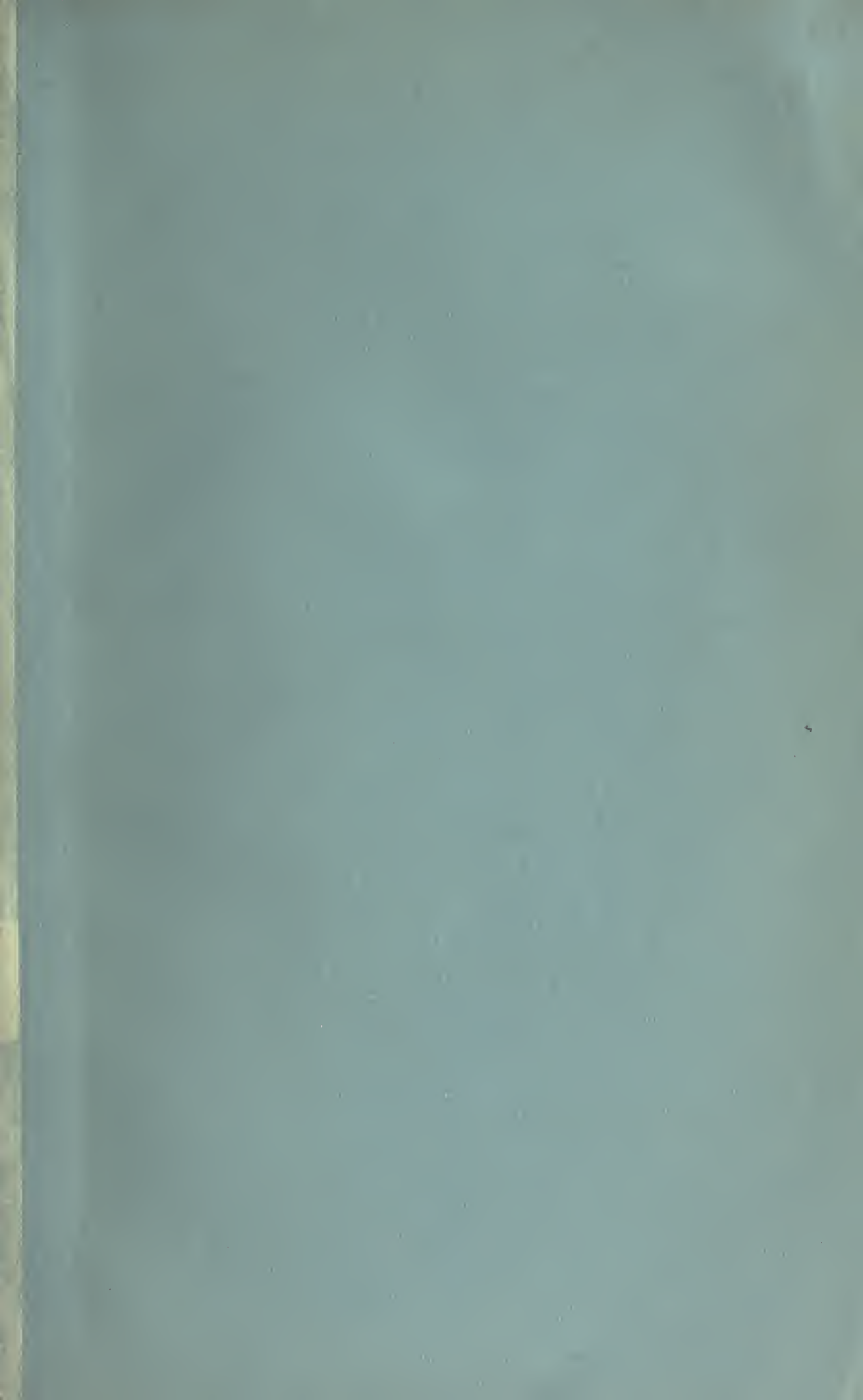
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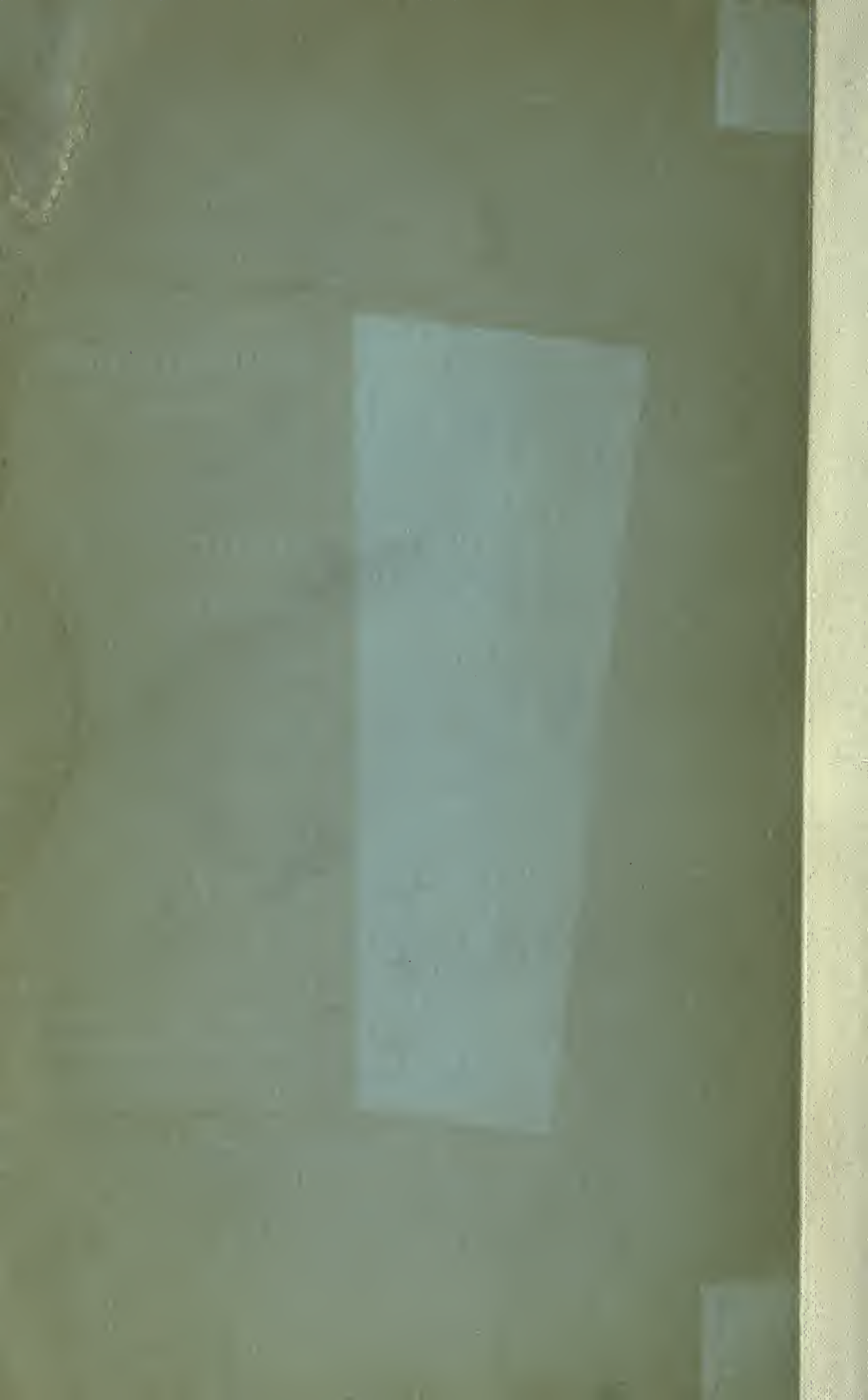
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