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DISCUSSION AS TO COPPER
FROM THE MOUNDS

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McGUIRE

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SHEET-COPPER FROM THE MOUNDS IS NOT NECESSARILY OF EUROPEAN ORIGIN¹

BY CLARENCE B. MOORE

(WITH DISCUSSION BY J. D. MCGUIRE, F. W. PUTNAM,
AND GEORGE A. DORSEY)

INTRODUCTION

Some years ago I included in the Second Part of my "Certain Sand Mounds of the St. Johns river, Florida," which appeared in the *Journal of the Academy of Natural Sciences of Philadelphia*, a paper on objects of copper found in aboriginal mounds. In this paper, where the matter is gone into much more fully than I have space to devote to it here, it was shown by many analyses that much of the copper of the mounds, including sheet-copper, was native copper, and much purer than copper which is recovered from ores by smelting and especially from the arsenical, sulphide ores of Europe, which, treated by the earlier smelting processes, produced a very impure article indeed. From this, then, it was evident that objects made from this pure copper were made by the aborigines from native copper, and not from copper furnished by the whites, since, as we have said, all European copper obtained by smelting was very impure and in Europe there is no supply of native copper sufficient for commercial purposes.

In view of this, the conclusion that the aborigines were making and using objects of copper, including sheet-copper, before the coming of the whites, seemed hard to avoid, and, in point of fact, it was almost universally accepted. Of the two persons who, in pri-

¹ This paper (which was read before a meeting of Section H of the American Association for the Advancement of Science, held at Washington, December 30, 1902) has been submitted to Dr H. F. Keller, Professor of Chemistry at the Central High School, Philadelphia, and long a specialist in analyses of copper, who writes that he has "not been able to detect any statement in regard to either composition or extraction of copper which would seem to require revision or correction." Prof. James Douglas, the authority on copper, President of the Copper Queen Mining Co. of Arizona, writes, "I have read with interest your paper, and thoroughly agree with all you say."

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vate letters, wrote in opposition to the conclusion arrived at, one frankly admitted his inability to draw conclusions from analyses, while the other, by stating that copper ore and native copper were practically the same because the difference between them was only a chemical one, indicated a lack of ability to form intelligent opposition.

The matter of the pre-Columbian use of copper, including sheet-copper, would have been considered as settled without further discussion had it not been that Mr J. D. McGuire, in his interesting and exhaustive memoir, "Pipes and Smoking Customs of the American Aborigines" (page 523 *et al.*),¹ seemed to regard copper in use among the aborigines to be necessarily of European provenance. This opinion, in a publication under government auspices, may be considered to reopen the question, especially as Mr McGuire (page 479), in quoting some of my reports on southern mounds, inadvertently makes it appear that copper met with by me was found under circumstances indicating its provenance from European sources.

Mr McGuire says :

"Mr Clarence B. Moore found at Fairview, Camden county, Georgia, a foot below the surface in a mound, a deposit of calcined human bones beneath a local layer of oyster shells, and associated with the bones was a sheet-copper ornament with *repoussé* decorations.² He refers also to four rings found on the finger of a skeleton at Madisonville, Ohio, by Professor Putnam, which were made from bands of sheet-copper. Besides finding a copper finger-ring in a mound near Woodbine, Georgia, and also a portion of a disc of copper in a mound in McIntosh county, Georgia, which was carbonated through, Mr Moore also found an eight-inch copper celt in a mound north of Creighton island, Georgia.³

"Such objects are said to be usually found near the surface, and polychrome and other glass beads were found in the mounds at a depth of two feet with human remains on or near the surface."⁴

I shall now explain more fully the cases cited by Mr McGuire.

¹ *Report of the U. S. National Museum for 1897.*

² Certain Aboriginal Mounds of the Georgia Coast, *Journal of the Academy of Natural Sciences of Philadelphia*, XI, p. 10, 1897.

³ *Idem*, pp. 13, 14, 25, 41, Philadelphia, 1897.

⁴ *Idem*, pp. 14, 23, 66, Philadelphia, 1897.

The mound at Fairview, where sheet-copper was found one foot below the surface, was but two feet eight inches high. No object distinctly of European manufacture was present in this mound.

The mound at Woodbine was four feet nine inches high. With the exception of buttons with a recent, intrusive burial, and a single glass bead "on or just beneath the surface, at a considerable distance from any burial," nothing unquestionably of European provenance was present in this mound. Associated with human remains, each a foot and a half from the surface, were ornaments of sheet-copper. Two feet from the surface, in place on a finger-bone, was a ring wrought from a band of sheet-copper.

The mound at the northern end of Creighton island was a sort of cemetery extending over 100 feet by 116 feet. The maximum height was about three feet, and certain interments, in pits, were three feet deeper still. Though two hundred and twenty skeletons were met with, no object of European make was found. The copper chisel — the only copper found here — lay with a burial in a pit, nearly six feet from the surface.

It will be seen by these details that the instances cited do not prove a European provenance for the copper found, and, in addition, I may say that among the many scores of mounds I have demolished, I have met with a number of large mounds where copper, including sheet-copper, associated only with objects purely aboriginal, lay from bottom to top, so that it would seem hardly fair to say that copper is usually met with near the surface of mounds.

I shall now try to prove my contention that copper met with in the mounds is not necessarily of European origin, and, as sheet-copper would seem to be more difficult for the aborigines to produce than other objects of copper, I shall bring forward proofs in relation to sheet-copper mainly, for if it can be shown that much of the sheet-copper of the mounds is native copper and consequently of aboriginal make, the origin of other objects of native copper may be taken for granted.

ASSOCIATION

I have written elsewhere that objects in mounds, like persons, are known by the company they keep, and the more mounds one opens the more one becomes convinced of this fact.

When one opens a mound which was made after contact of its makers with the white man, one is likely to realize that fact by the nature of many of the objects found in that mound. Lead, glass, earthenware with a glaze, pewter, iron (except meteoric iron), and brass are distinctly of European provenance and are found in abundance in mounds whose makers have had an opportunity to acquire them from the whites; and here it may be said that much of the so-called copper from post-Columbian mounds is in reality brass — most, if not all, of the so-called copper kettles are brass, and much so-called sheet-copper is brass, though, of course, some sheet-copper was furnished the aborigines by white men, but this copper, by its component parts as shown by analysis, is just as distinctly European as the other articles in the list given above.

On the other hand, when one demolishes a mound of any size, and, after the exercise of the utmost care, among many objects met with finds nothing of European provenance, it would seem safe to infer that the mound was completed before intercourse with Europeans began.

Among the great number of mounds I have leveled in the south, there have been a considerable number in which sheet-copper has been associated with objects of aboriginal make, from the bottom to the top, and these mounds have yielded nothing distinctly European. Among mounds of this class I may cite the great ~~Shields~~ mound, near the mouth of St Johns river, Florida; the famous mound known as Mt Royal, Florida; and the large mound on Tick island, near St Johns river, in the same state, full accounts of which have appeared in my reports published by the Academy of Natural Sciences of Philadelphia. Does it seem possible that the aborigines, trading with whites, should obtain from them sheet-copper only, or that, obtaining articles of different kinds, they should select only sheet-copper to put into these mounds and carefully exclude all other foreign articles?

RESULTS OF ANALYSES

Before giving results of analyses of copper, it may be well to remind those who have not made a speciality of this subject that, in copper analyses, a difference of a unit or two, as in the case of

the barometer, amounts to a great deal. Copper, for instance, containing two percent of impurities is a very impure article indeed.

Results of analyses of native copper, which results coincide with analyses of most of the copper from the mounds, differ as greatly from analyses of copper furnished to the aborigines by the whites, smelted from the arsenical, sulphide ores found in Europe, as day does from night.

Here is the result of an analysis of sheet-copper from Mt Royal, made by A. R. Ledoux, M.S., Ph.D.:

Copper	99.85 percent.
Silver	trace.
Iron	trace.

Sheet-copper from the Grant mound, according to the analysis of Ledoux & Co., showed :

Copper.....	99.730 percent.
Iron	00.034 “
Silver.....	00.023 “

In a mound near Picketon, Pike county, Ohio, Mr Gerard Fowke found a certain quantity of sheet-copper which was 99.9130 percent pure.

Now let us consider analyses of copper unquestionably obtained from the whites by aborigines.

I am indebted to David Boyle, Esq., of the Ontario Archeological Museum, for a fragment of copper taken by him from a grave of the Tobacco Hurons, with articles of European origin, which yielded to analysis :

Copper.....	98.970 percent.
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Impurities present were silver, iron, arsenic, antimony, nickel, cobalt, and lead.

Lead was used in former smelting processes in Europe, but is not found in native copper. This presence of lead in European copper until recent times, and the absence of lead from native copper, are practically another final test ; for if it is shown that much of the copper of the mounds does not contain lead, it is evident that this copper is native copper, to which Europeans did not have access at that time.

It must be borne in mind, however, in testing copper for the presence of lead, that sulphuric acid itself often contains lead, and that before making important analyses the sulphuric acid to be used must itself be tested, without regard for the statement of the manufacturer. This point cannot be too strongly emphasized.

Copper rivets from an Iroquois brass kettle, Fleming, N. Y., showed copper 97.03 percent, and as impurities, lead, silver, iron, cobalt, nickel, arsenic, antimony, and bismuth.

A sheet-copper ornament found by me near Montgomery, Ala., in a mound which contained many articles of European origin, analyzed by Dr H. F. Keller, yielded: copper 97.425 percent and ponderable quantities of lead, silver, bismuth, antimony, arsenic, iron, and nickel.

Here we see the great list of impurities which appear in copper admittedly smelted from the arsenical, sulphide ores of Europe, and this was the only kind of copper Europeans possessed in those days.

Although at the present time, in Europe, copper is smelted by improved processes to yield a high percentage of the pure metal, yet ponderable quantities of many impurities still remain in it. Analyses of modern German (Mansfeld) copper give 99.2 percent to 99.5 percent of the pure metal and ponderable quantities of silver, gold, arsenic, antimony, bismuth, lead, iron, cobalt, nickel, sulphur, and oxygen.

In conclusion, then, I make the following offer to those who continue to maintain that all the sheet-copper from aboriginal mounds is of European origin, or to cite the presence of sheet-copper with objects in mounds irrespective of the degree of purity of the copper, as a proof of the European origin of these objects. I will furnish sheet-copper from aboriginal mounds in Ohio and in Florida, in which mounds no object distinctly of European make was met with, and will name an expert to analyze the copper in conjunction with an expert named by the other side, that this matter may be settled, if it is not settled already.

I doubt not that those who have carefully followed this paper will agree with me that the results of analysis will show a copper not only far purer than any that can have been smelted from the

arsenical, sulphide ores of Europe by the imperfect processes of the fifteenth, sixteenth, seventeenth, and eighteenth centuries, but will give, moreover, a far shorter list of impurities than copper that is smelted in Europe even at the present day.

DISCUSSION BY JOSEPH D. MCGUIRE

The paper just read is apparently due largely to my suggestion that the sheet-copper found by Mr Moore in the sand mounds of Florida owed its origin to European influences. The two volumes issued by him illustrative of two winters' labor in Florida are works any one could well be proud of; the illustrations are most excellent, and from them we are able to judge fairly well what the objects themselves are, and what their ornamentation, whether that of a period of savagery or of civilization.

I have been invited by Mr Moore to give my views on the subject, and I do so with great pleasure, as it is one of more than ordinary interest to archeology and to archeologists.

The articles found by Mr Moore consist largely of objects of extremely thin sheet-copper, embossed and ornamented commonly by *repoussé* work of dots, lines, or curves, and of certain pieces thinly overlaying objects of wood, etc. The thinness of this sheet-copper may be judged from the specimen I now present, which was sent to me by Mr Moore some years since.

It will not be questioned that the metal found is of wonderful uniformity if it belongs to a pre-Columbian period and owes its origin to a people living in a pure age of stone and of savagery. Its thinness cannot be compared with anything found elsewhere in the Americas, unless it be with certain objects found in the mounds of Ohio. The technical skill necessary to produce such material is of no mean order, and we are not accustomed to place the primitive Floridian in the human family above the average in culture of the American Indian as he was first found by Europeans. Had there been a people producing such objects at the advent of the whites, can it be questioned that such a fact would have been referred to by early writers who have recorded everything with which they came in contact worthy of notice? The absence of such reference,

however, is merely negative and proves nothing, but it is testimony bearing on the subject and consequently is worthy of consideration.

I shall first discuss the subject from a technological standpoint, being able in that respect to advance something more than theory alone, having experimented some years since in the U. S. National Museum for two or three months in hammering copper, both cold and hot, with stone implements chiefly, but also with a metal hammer on an anvil.

The crude metal is primarily in the condition it comes from the mine ; that is, in the nugget or in the sheet as found in the fissure of the rock. There is some evidence of prehistoric melting of metals among the more highly developed people of South America and Central America, but none referring to such methods being practised by the aborigines of the United States. If I am correct, we must treat the subject as work performed by means of some process of blows or pressure, the sheet by blows of a stone hammer upon a piece of metal lying on a hard surface. Among the finds in the Florida mounds I observe no reference to implements with or upon which such sheets could be made at all approaching those found by Mr Moore.

Experimenting with copper from the mines of the Lake Superior region, I found, in each instance of many made upon nuggets of varying sizes, that almost from the very beginning of the hammering process the metal began to crumble and continued to do so whether it was hammered cold or hot. After experimenting with stone tools, those of steel were resorted to with results little if any better, so far as producing sheet-copper was concerned. With a sheet of native Virginia copper much better results were obtained with stone tools, and the process was entirely successful to the point corresponding to that referred to by one of the early writers who spoke of the natives having metal which could easily be bent between the fingers. By using an anvil and a steel hammer, naturally much better results could be obtained.

A second suggestion contradictory to the belief that these objects were of native conception, is the embossed work on most of the objects to which reference is made in Mr Moore's publications. The magnificent object over ten inches broad here shown from the

Mt Royal mound, from an esthetic point of view suggests European influence and is far superior to any object of admittedly pre-Columbian origin. The typical *repoussé* work suggests a familiarity with characteristic metal-work of Europe not consistent with savage methods or culture.

From Peru, throughout the Gold Coast, through Central America, and throughout eastern United States as far north as Canada, every early traveler refers to metal being possessed by the natives, and that metal copper, though it is contended that no single reference to really primitive metal refers to embossed work such as Mr Moore presents in his publication.

The pipes from Tick island and Grant mound do not by their form suggest great antiquity to the writer, although next to the straight tube they are in the writer's estimation one of the oldest of pipe forms.

A canine tooth found at Tick island, according to Cope, was not wolf, nor coyote, but dog, and this was found in the shell base. That the mounds varied in age Mr Moore does not question, but his argument that not finding European objects in a mound is evidence of their being pre-Columbian cannot be admitted as a scientific fact.

The age of objects of copper in America, especially if from the mounds, wherever situated, is by no means so universally accepted as Mr Moore's paper suggests to be the case.

The allusion in my publication on pipes¹ questioning the American origin of copper in the mounds, relates to pipes of the "*mound type*" being usually associated with objects of copper and therefore showing European influences. This assertion I desire to reiterate. But the "*mound pipe*," as my publication shows, owes its origin, in the writer's opinion, to the metal file, and the "*mound pipe*" is not found in Florida.

If through inadvertance, as suggested, I have made it appear to others that Mr Moore has in any way been misquoted, no one can regret it more than I do; but reading over the paragraph carefully, I do not see that Mr Moore is quoted as other than the discoverer of the objects referred to.

¹ *U. S. Nat. Mus. Rept.*, 1897, p. 523, etc.

The writer believes that the American Indian was an apt pupil, possessed of rude implements of copper at the advent of the whites. He learned in Florida in 1518, and subsequent to the destruction of the Narvaez expedition, much of the use of metal; he learned more from the De Soto expedition in 1540; he traded with Raleigh's expedition in 1584-85; and Captain John Smith repeatedly refers to trading copper with Powhatan, who was no exception to the Indian who was always eager to possess the shining kettles of the European.

It may not be amiss to suggest that the *repoussé* work appears in European armor of the sixteenth, seventeenth, and eighteenth centuries, and that possession of metal by the natives was greatly added to by trade with the whites, by wrecks, and later by mining.

MR MOORE'S REPLY TO MR MCGUIRE

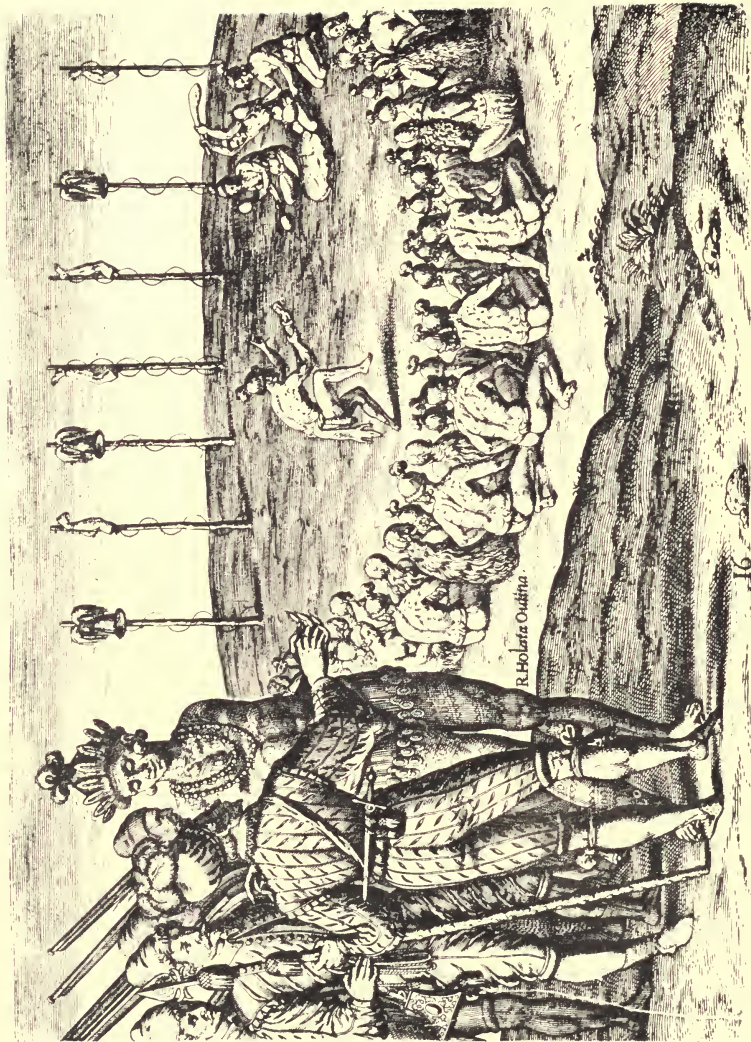
Mr McGuire's reply to my paper on aboriginal copper, which was read before Section H at the last meeting of the A. A. A. S., has courteously been submitted to me.

It should be a matter of congratulation to archeologists that one so well known as Mr McGuire has come forward to state his grounds of disbelief in sheet-copper of purely aboriginal origin, since arguments on both sides, when presented together in the *Anthropologist*, must greatly add to a clear understanding of the matter. It must be a subject of regret to all, however, that to the chemical side of my paper, where assertions pro and con are capable of exact determination, Mr McGuire makes no reply whatever.

I shall now take up, in order, the points advanced by Mr McGuire in his reply to that part of my paper which he has answered.

It is impossible to judge of the original evenness and thickness of the sheet-copper found in mounds, especially in Florida mounds, which are of sand and allow free access of water, thus facilitating the formation of the oxide and of the carbonate which, in the course of time, considerably impairs the original volume of the sheet-copper. Indeed, at times, in these mounds, there remains of an ornament but a minute fragment, sometimes only a stain on a bone.

The sheet-copper found by me and by others in mounds is not of uniform thickness, and incidentally it may be said that no two



A PLATE FROM DE BRY, SHOWING USE OF COPPER ORNAMENTS

ornaments from the mounds are exactly alike. Sheet-copper ornaments with *repoussé* decoration have been found by me, not alone in Florida, but in Georgia and in Alabama. Moreover, sheet-copper ornaments and ornaments overlaid with sheet-copper have been found in Tennessee, while the deposits of copper found on the Hope-well altars and in other mounds of Ohio are too well known to need extended reference here.

The presence of embossed ornaments is not unrecorded by early historians as Mr McGuire would have us believe. We have but to turn to the plates of Le Moyne, an eye-witness, in De Bry's *Florida*, particularly plates XII, XIII, XIV, XVI, and XVIII, three of which are reproduced in this paper, to see depicted on aborigines the very type of embossed ornaments which I have taken in numbers from the Grant mound near the mouth of St Johns river, which must have been within a short distance of where the ill-fated French Huguenots built Fort Caroline in 1564, and near where, says Laudonnière, lived the chief "Satourioua, our nearest neighbor, and on whose ground we built our fort." (See plates VIII to X herein.)

It is believed that the point visited when the expedition from Fort Caroline sailed up the river May (St Johns) was near the northern extremity of Lake George, since this is the only lake on the river filling the conditions of the description. If such is the case, the headquarters of the great chief Outina must have been near Mt Royal, where I found numbers of embossed ornaments of sheet-copper, including one, a representation of which we give (figure 1), closely resembling those shown by Le Moyne on chief Outina. While Le Moyne was not always exact as to details in his drawings, yet there are many novelties which he portrays with

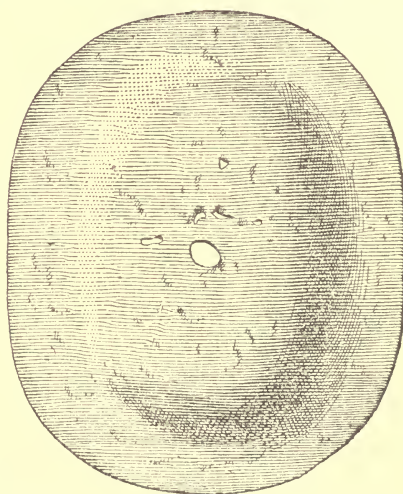


FIG. 1.—Ornament of sheet-copper from the Mt Royal mound. (Actual size.)

comparative fidelity, including scalps, shell drinking-cups, shell beads, ear-plugs, ceremonial fans, serrated spear-heads, a wooden mace as found by Mr Cushing at Marco, a method of attaching ornaments by running a cord or sinew through the center and knotting on the outside, etc. Is it not certain, then, that copper ornaments the exact type of those found by me in mounds of St Johns river, situated on the very spots visited by the Huguenots with whom Le Moyne was, must have been seen by him on the aborigines, as portrayed by him?

There are slabs of stone and abundance of hammer-stones and pebble-hammers in the Florida mounds, which would have served well for the manufacture of sheet-copper. I am not prepared to demonstrate, however, that copper ornaments found in Florida were made there, though I do not see why they should not have been.

I do not see for what purpose Mr McGuire has referred to his ill-success with Lake Superior copper, which, as the reader is aware, is native copper. Is it to show that "Lake" copper is not malleable, and, therefore, that sheet-copper ornaments could not have been made from it? It is too well known that very much of the copper from Lake Superior is malleable to call for further discussion.

As to embossed work showing European influence, as Mr McGuire states, it can be said in opposition that embossed work is shown in De Bry and that it is extremely unlikely that in a comparatively short time objects made by, or with the aid of, Narvaez' or De Soto's men could have been widely spread throughout Florida.

As to the breast-plate from Mt Royal (figure 1), I would say that to many archeologists it does not of necessity suggest European influence and is not believed to be far superior to any object of pre-Columbian origin.

It is contended by Mr McGuire that no single reference by early travelers to really primitive metal refers to embossed work such as is shown in my publications. It would be hard to prove just what style of copper is referred to by early travelers in certain cases. They did not always go into minute details, sometimes speaking of "a vessel of wood," "a vessel of clay," etc., and embossed work might not be deemed worthy of especial description. We have seen, however, how, when it became necessary for Le



A PLATE FROM DE BRY, SHOWING USE OF COPPER ORNAMENTS

Moyne, the artist who accompanied the Huguenots to Florida and was with them at Fort Caroline, to show what he had seen, embossed ornaments were faithfully portrayed.

The pipes from Tick island and the Grant mound do not suggest great antiquity to Mr McGuire. It seems hardly fair for Mr McGuire here to cite the presence of certain pipes in these mounds in order to show a comparatively recent origin for the copper found with them, and then in his work on pipes to instance the presence of copper to show a late origin for pipes.

I freely admit that the remains of a dog were found by me in the base of the Tick island mound and that they were contemporary with the mound. Surely Mr McGuire does not cite this to show European intercourse with the makers of the mound. The existence of the aboriginal dog is admitted. Cabeça de Vaca, one of Narvaez' men (1527 and later), who spent some time in north-west Florida, repeatedly refers to numbers of dogs. White men could not have distributed these animals through Florida at this early period.¹

It is true that not finding European objects in a mound is not absolute proof that the mound is pre-Columbian, but it is a strong argument to that effect, and when a number of large mounds in a district, as is the case in Florida, or all the mounds in a district, as in the Scioto valley (whence came the famous Hopewell deposit of sheet-copper ornaments), show no object of European provenance, then the evidence seems very strong indeed. Of course the distinctly intrusive burial, which so often has European articles with it, must not be cited as proof of the post-Columbian origin of a mound. Incidentally I may say that in the great Grant mound, in Mt Royal, in the Tick island mound, and in other large mounds of Florida, no intrusive burial was met with.

Mr McGuire believes "the age of objects of copper in America, especially if from the mounds, wherever situated, is by no means so universally accepted as Mr Moore's paper suggests to be the case."

¹The dog had been domesticated and was used as a beast of burden also by the Apache Indians of the plains of Texas at least as early as 1541. For references to dogs seen by members of Coronado's expedition, see Winship, "Coronado Expedition," in *Fourteenth Report, Bureau of Ethnology*, passim. —EDITOR.

To this I would reply that, judging from letters received by me when my original paper on aboriginal copper was published, I do not think Mr McGuire could then have found a corporal's guard among the archeologists of America to say it was their belief that sheet-copper from the mounds is, of necessity, of European origin, and it is my belief that Mr McGuire now would be unable to name any archeologist of note in the United States who shares his views as to copper. I trust Mr McGuire, whom I esteem most highly personally, will pardon me when I say that I have undertaken to show what I believe to be the weakness of his position as to copper, not because I consider his opinion of much avail as against that of the archeologists of the United States, but for the reason that archeologists of Europe, having seen Mr McGuire's views as to aboriginal copper in a Government publication, might suppose these views met with endorsement in this country, which is certainly not the case. Mr McGuire has kindly consented to write a few lines in sur-rebuttal of this reply of mine. I would esteem it a favor were he to name, for the benefit of the archeologists of Europe, such American archeologists as share his views.

By stating that the mound pipe has not been found in Florida, it seems to me Mr McGuire weakens his argument as to Florida copper, from his standpoint. Truth compels me to say, however, that I have found "monitor" pipes in Florida mounds, though not in the mounds of the peninsular part of the state.¹

I would say, however, that many archeologists disagree with Mr McGuire as to the presence of file marks on mound pipes and believe that there are no marks on them but could have been made with tools of stone.

I did not assert in my paper that Mr McGuire had not given me due credit as discoverer of the copper objects in the Georgia mounds, but I did think that Mr McGuire, inadvertently, had described the objects discovered by me in a way to make them appear of European origin.

As to the copper which Mr McGuire says was acquired by the Indians by trading and by shipwreck, I can only repeat that much

¹ *Certain Aboriginal Remains of the Northwest Florida Coast*, part II, pages 225, 238, 256, fig. 213.



A PLATE FROM DE BRY, SHOWING USE OF COPPER ORNAMENTS

of what has been called sheet-copper, found with late burials, is in reality sheet-brass, and as to this I can speak from personal experience, often repeated, and that the so-called copper kettles I have seen have been brass kettles and that such sheet-copper as could have been procured by trading or by shipwreck would, of necessity, be European copper and that European copper is as different from native copper as night is from day and that analysis has shown the copper from mounds in Florida, in Ohio, and elsewhere in which no object distinctly of European provenance has been found, to be native copper.

In conclusion I would say there is no one whose conversion to our way of thinking as to aboriginal copper would be more welcome than that of one who has given so much attention to the subject as has Mr McGuire, and it would seem as though this consummation might be realized, for Mr McGuire, step by step, is abandoning his original position, as what follows will clearly show.

In his interesting memoir on pipes, Mr McGuire says (page 523): "His reference from a naturalist's standpoint naturally ignores the technological consideration of the subject, as well as the contemporaneity of metal in the mounds, especially copper."

Here Mr McGuire cites the presence of copper, just copper, as a proof of modern origin.

Continuing, he says, "also the many asserted discoveries of objects of undeniably European manufacture, such as an implement of copper."

Here it is copper wrought into implements, at which Mr McGuire draws the line.

Mr McGuire now admits in his answer to my paper that rude implements of copper were in the possession of the aborigines before white contact; he thus abandons his former position as to the metal copper and implements of copper.

Now we come to the next step. In a late writing Mr McGuire cites the presence of *sheet-copper* with a pipe as an evidence of its European origin. Here we have the line drawn at *sheet-copper*.

But now Mr McGuire, in his reply to my paper, admits that he has made from native metal a copper that will bend backward and forward, and cites an early writer to show that copper of this de-

scription, which practically was sheet-copper, was found by the whites in the possession of the aborigines; so here Mr McGuire goes still another step farther, to rude sheet-copper in pre-Columbian times.

Finally, in his reply to my paper, the line seems to be drawn at thin and uniformly made sheet-copper, embossed; so Mr McGuire seems to be gradually abandoning his contention and to be coming toward us step by step. Let us hope that his next step will be to throw overboard what is left of his theory as to copper and join the camp of those who, relying on proofs, — historical, technological, chemical, and of association, — believe in the purely aboriginal origin of most of the mound copper.

MR MCGUIRE'S CONCLUDING REMARKS

The opinion originally expressed, that the discovery of sheet-copper among aboriginal remains, wherever found, is suggestive of European influence, is not weakened in the slightest by Mr Moore's reply to my criticism of his paper, as I shall endeavor to explain, following the order of his remarks.

It cannot justly be a matter for regret to archeologists that I make no reply to the "chemical side of the paper" when I admit my inability to do so from a chemical standpoint, and would consequently not be excusable were I to attempt to argue a subject upon which I knew I was incapable of intelligently expressing my views.

I do not hesitate, however, to venture the assertion that the formation of carbonate and oxides has not impaired the original evenness and thinness of Mr Moore's copper finds to a degree sufficient to prevent our seeing enough to form a fair estimate of the original appearance of these interesting objects, the technique of which is so indicative of an art peculiarly un-American, as is shown in Mr Moore's figure 1. There is an evenness about it and a regularity suggestive of the handiwork of a skilled metal-worker, and if that worker was an Indian the white man must have taught him the use of the tools. That the Indian in certain localities was an apt pupil in metal work is related by more than one historian of Mexico and Peru, who early observed that in working metal the Indian quickly surpassed his Spanish teacher in skill.

The *repoussé* work, consisting of dots, lines, and curves (including circles) impressed on thin sheet-copper, as shown by Mr Moore's discoveries, means infinitely more than the mere hammering down of a nugget, for evenness had to be maintained throughout, and when attained it was requisite that it be continued throughout the whole process of creating the *repoussé* decoration or effect.

The amount of copper found by Mr Moore in his excavations indicates a source of supply more abundant than can be imagined to have been furnished by aboriginal trade, regardless of whether the supply came from Lake Superior or from Virginia, though such supply could have been furnished by the whites, with whom we know the Indians, from the very beginning, and from the St Lawrence to the Rio Grande, traded for copper.

Le Moyne, the artist and author of the De Bry plates, was in Florida with the expedition of René Laudonnière, about 1565. The plates referred to are in De Bry's *Brevis Narratio* which constitutes part 2 of the *Collectiones Perigrinationum*, published in Frankfort-on-the-Main in 1591. Of this work Joseph Sabin, in his *Dictionary of Books Relating to America*, says: "It is true that numerous plates were added to these texts, but they had been made for the most part after fanciful designs, adapted, some well, some ill." Mr Moore, in apology, however, himself suggests Le Moyne's want of exactness as to details. But admitting, for the sake of the argument, Mr Moore's contention that Le Moyne did see these objects, I would call attention to plate 42, one of the series in this same volume, which represents an Indian standing over a French prisoner in the act of killing him with *an axe*, the axe having *an eye* to it and a *helve in the eye*. Therefore, to follow Mr Moore's line of argument, we should believe that the natives possessed such axes prior to the arrival of the whites, although we have Laudonnière's assertion that he compensated the natives who sent him presents, with axes, knives, glass beads, and mirrors.

The plates represent, let us admit, metal plates; they hang on the breasts of the natives and from their girdles, and in the foreground of one illustration are represented quite a pile of them. In De Bry's plate 12 a native sorcerer is represented as kneeling in *D'Ottigny's shield*, which is of the exact type of the metal plates

figured. Let us go one step further in this interesting inspection. Laudonnière records that these natives told him that their women danced with plates of gold hanging from their girdles, the greater part of which came from the Spanish ships wrecked fifteen years before (or about 1550), and that numerous ships were wrecked in the straits. In the legends describing the forty-two plates of De Bry's second volume, there is not a word of reference to copper ornaments, an omission which would appear very singular were one to suppose Le Moyne's figures accurate.

Hariot, in 1585, referring to the Raleigh expedition, describes conditions more accurately when he refers to receiving twenty-six deer-skins in exchange for a copper kettle, which the Indian immediately knocked a hole in and suspended from his neck as an ornament; and this occurred on the Carolina coast, presumably nearer the source of aboriginal copper supply than was Florida. At this time Ralph Lane wrote from Roanoke to the Company in England that they could do no better than to send over copper articles of all kinds with which to trade, quaintly expressing his views that "copper caryeth all so it be red."

I agree with Mr Moore that copper ornaments found in Florida could have been made there as well as anywhere; but that signifies nothing, for the plates, if made in Florida, must have been fashioned through white influence, as shown in every line, and by their evenness and their curves. My reference to working nugget copper from the Lake Superior region was given for the purpose of recording my own experience — to show that *I* could not work it, although the specimens were sent to me as the most ductile they had in the region. But I did work a piece of fissure copper, from Virginia, to such thinness that I could bend it with the hand.

Regarding the embossed work figured in De Bry's illustrations, I submit there is no more reason to attribute it to savage origin than there is to so attribute the eyed axe above referred to.

Narvaez was in Florida in 1528; twelve years later De Soto passed through the country; both lost men there, and the numerous Spanish wrecks on the coast must have thrown many men into the hands of the natives up to the time of Laudonnière, from whom the natives could have learned the art of copper working. Le

Moyne, if he saw the plates, recorded also seeing the eyed axe. If seeing the plates made them aboriginal, what prevents the same argument from applying to the axe?

Having made an exhaustive study of aboriginal American pipes, or perhaps I should say primitive pipes, there can surely be no objection to my drawing deductions from personal experience, especially where it is confined strictly to a line along which I am supposed to be able to form them intelligently.

I do not deny the existence of dogs in Florida before the coming of the whites, nor do I admit it. I would say, however, that the want of references to dogs in the literature of the region indicates the probable absence of that animal, though the Coronado expedition found dogs in the west in 1541 used as pack-animals, while Cabeça de Vaca refers to dogs hundreds of miles west of where Mr Moore's discovery of a dog bone was made.

I do assert that the presence of dog bones in mounds is suggestive of European intercourse, and the same argument applies in the case of the finding of the bones of the great auk in a Florida shell-heap, which gave rise to much discussion as to how they got there. My suggestion that they may have been brought as sea stores by early voyagers was not received as worthy of consideration, but when so distinguished an osteologist as F. A. Lucas recognizes from the same shell-heap "the humerus of a typical dachshund,"¹ the suggestion I first made becomes almost a certainty, for the dog bone came from the same part of the heap as did the bones of the great auk.

I see no reason why I should not reiterate my remark "that the age of copper objects in mounds is by no means so universally accepted as Mr Moore suggests." In this category I include also the finds in the Hopewell deposit as a matter of course. I claim that sheet-copper is suggestive of European influence and have difficulty in believing Mr Moore serious in asking of me the name of "any archeologist of note who shares my views as to copper." I have asserted that there were such, and reassert it now. I may go even further and say that I can name one archeologist of international reputation who agrees with me that the thin sheet-copper

¹ *Science*, February 20, 1903.

with *repoussé* work on it owes its origin to European influence, but I have no right to bring others into a controversy for which Mr Moore and presumably others hold me alone responsible, a position which I am perfectly willing to defend. I can only feel grateful to Mr Moore for his personal opinion expressed of me individually, even though he does not consider my opinion of "much avail" on the copper question. But let us keep to the text and argue our subject to archeologists, who form our jury.

In such papers as I have written for publication by our National Museum I have never thought for an instant that any one could suppose what I have said should be considered to have official significance, for my work was solely that of a volunteer who had made a study which was regarded as of sufficient value for publication by the Museum and which would be accepted by students as the author's opinion and entirely on its own merits.

Pipes of all forms in the United States, except the tubular pipe, as I have shown in my paper, belong in contiguous areas. To this I know of no exception. Both the mound type of pipe and the monitor pipe I have asserted to be of comparatively recent origin, for the reason that in places on certain of them are observed a number of flat surfaces or facets, and in or on these facets appear series of three, four, and five (commonly the latter), straight lines, parallel and equidistant. These facets I can intimate only with a file. I cannot reproduce them with *any stone tool*, and could only be convinced to the contrary by some one actually reproducing the marking or something slightly resembling it. I have explained my views on this subject to many archeologists, and assert that, up to the present, from no one have I heard a suggestion indicating a method by which the work could be imitated. When it is shown to be due to an Indian method of work I will be glad to accept the proof, for no good will be gained by maintaining a contrary course. Those pipes, considered artistically, are indicative in every line of European technique.

Mr Moore's assertion that the copper which I suggest was acquired by the Indians through trade and by shipwreck was sheet-brass as he can assert "from personal experience, often repeated," brings into the controversy the assertions of Hariot, Smith, and

others that the Indians so traded, and further, examples of copper kettles in the National Museum, of European make, worked into ornaments, are too numerous to admit of doubt as to their existence.

For Mr Moore's kind wishes for my conversion "to our way of thinking," I feel very grateful, and join freely in his wish, for its accomplishment is but a prerequisite to conviction of error, and when Mr Moore or any other person maintaining a similar belief offers suitable proof to overcome my scepticism on this subject, I will gladly proclaim my conversion.

I have never denied the possession of copper by the aboriginal Americans; on the contrary, I believe that practically all early voyagers, from the Cabots and Verazzano to Cartier and Smith, refer to the use of it, one writer saying they had it of a thinness allowing of its being bent between the fingers.

Every step of Mr Moore's argument in his reply to my remarks only emphasizes what I have contended from the beginning, and have never abandoned, that sheet-copper found in the mounds, or elsewhere, is strongly suggestive of European influence, consequently I fail to see what has been "thrown overboard"; but, to quote Mr Moore's words, "relying on proofs, historical, technological, and of association," there is not a particle of valid evidence to sustain the contention of Mr Moore as to the aboriginal origin of most sheet-copper. On the contrary the natives did possess and work copper rudely and as a malleable stone. But when copper is found in thin sheets and those sheets are embossed and ornamented with *repoussé* work; and when spear-heads are furnished with sockets, and the sockets are furnished with nail holes, we may safely assert that white influences are proven.

Of the excellence of Mr Moore's work all American archeologists are proud, and its appreciation is neither enhanced nor lessened by the age of his finds. I even admit that the opinion of a majority of archeologists is adverse to my own on the subject of the origin of mound copper; nevertheless I maintain the correctness of my views. An auk bone in one place and with a dachshund accompaniment, a glass bead in another, a crucifix in another, a ferule in another, medals in different localities, finger rings, curved base mound pipes, and even molded pipes with their artistic finish,

are all straws pointing in the single direction toward the first settlers, French, Dutch, and English, with their knowledge of artistic treatment and mechanical skill.

The case is not unlike that of the paleolith. A few years ago *all* believed it indicative of a low stage of culture in America and elsewhere. A few of us, after experiment, recognized in the paleolith a mere reject, the shape of which could not be improved. At first this was considered, like the case under discussion, heterodox; but a few were convinced in time, after thorough investigation, of the proper position of the so-called paleolith. There are yet those in America who place their faith in the paleolithic period, but they are gradually lessening in number. Our European contemporaries will, in time, be convinced of their error we feel sure. For myself, the thin sheet-copper, considered from any point of view, with its *repoussé* work has even less to stand upon and will in time be placed in the position to which it belongs, and that certainly post-Columbian.

Since concluding my remarks above I have re-read Dr Cyrus Thomas' paper on "Mound Explorations" in the Twelfth Report of the Bureau of Ethnology. Referring to certain well-known plates from the Etowah mounds, in which the *repoussé* work is prominent, Dr Thomas says (page 308): "That they were not made by an aboriginal artisan of Central America or Mexico of ante-Columbian times, I think is probable, if not from the designs themselves, from the apparent evidence that the work was done in part with hard metallic tools." Again (page 711): "What is here affirmed, and what, it is believed, can be successfully maintained by reference to and inspection of the articles, is, that many of them, found in the mounds as well as ancient graves, have been made from sheets of copper so uniform and even as to forbid the belief that they were hammered out with the rude implements possessed by the mound-builders of pre-Columbian times." Dr Thomas suggests that a careful chemical and microscopical examination might settle the point. I have submitted these quoted remarks to Dr Thomas, who says he is of the same opinion still. I submit that Dr Thomas' name will satisfy Mr Moore's request and be an answer upon which both American and European archeologists may ponder.

MR. MOORE'S REPLY TO MR. McGUIRE'S
CLOSING REMARKS.

(The following was written after the appearance of the symposium as to aboriginal copper, which appeared in the "American Anthropologist," January-March, 1903.)

There are certain points in Mr. McGuire's interesting closing remarks in the "Anthropologist" that seem to need comment and explanation.

Mr. McGuire says: "The amount of copper found by Mr. Moore in his excavations indicates a source of supply more abundant than can be imagined to have been furnished by aboriginal trade, regardless of whether the supply came from Lake Superior or from Virginia, though such supply could have been furnished by the whites, with whom we know the Indians, from the very beginning, and from the St. Lawrence to the Rio Grande, traded for copper."

The amount of copper found by me is, in reality, very limited, and especially so, considering the twelve years I have given to mound work and the many scores of mounds I have demolished. If Mr. McGuire makes this assertion as to copper, what can he say as to the vast numbers of polished "celts" which have been taken from Florida mounds? These "celts" are wrought from rocks not found in Florida and come from northern Georgia or farther away. In bulk and weight they exceed the copper a thousand fold, and yet they reached Florida through aboriginal trade.

By this assertion of Mr. McGuire that the copper found by me in Florida indicates a source of supply more abundant than can be imagined to have been furnished by aboriginal trade, he shuts himself out from alleging that the aborigines, taught by Europeans, made these sheet-copper ornaments from native copper in their possession. *The reader will please bear this point in mind.* The copper must be European, according to Mr. McGuire, yet by chemical analysis copper from the mounds in which, except superficially, no artifacts surely of European provenance are found, is shown to be native copper not obtainable in Europe, and this native copper is the material of which practically all the ornaments found by me in

Florida, Georgia and Alabama are made, and native copper is the material of the ornaments from the Turner and the Hopewell mounds of Ohio, and the Etowah mounds of Georgia, and the stone graves of Tennessee, as well as of the solid implements of Wisconsin and of Canada, and of the copper objects of other districts in the United States, which are found unassociated with European artifacts.

Should Mr. McGuire, however, shift his position, as the careful reader will recall he has done more than once since first he wrote about copper, and say that the aborigines did not depend on European copper and brass, but under tuition of the whites, used native copper which was among them, he would strengthen his position to a certain extent, but would still find himself face to face with the testimony of the mounds, which is practically conclusive.

Of Le Moyne's plates from De Bry, cited by me, Mr. McGuire says: "The plates referred to are in De Bry's *Brevis Narratio*, which constitutes Part 2 of the *Collectiones Perigrinationum*, published in Frankfort-on-the-Main in 1591. Of this work Joseph Sabin, in his *Dictionary of Books Relating to America*, says: 'It is true that numerous plates were added to these texts, but they had been made for the most part after fanciful designs, adapted, some well, some ill.'"

If the reader will now kindly consult Mr. McGuire's exhaustive memoir on "Pipes and Smoking Customs of the American Aborigines," Report of the National Museum, 1897, pages 414 and 415, the reader will be interested to see the following statement by Mr. McGuire: "Fig. 45 is one of the earliest representations of the American pipe, showing a separate stem, drawn after an illustration of De Bry, in *Brevis Narratio*.³ The woman is represented as furnishing the man with leaves from a bowl or basket of the period of Laudonnière's visit to that part of the territory then called Florida, which covered an indefinite geographical area." With this, is a representation of an Indian smoking in the presence of a woman, taken from De Bry. Below this representation is, "Fig. 45. FLORIDIAN SMOKING. *After De Bry. Brevis Narratio.*"

Mr. McGuire, in his own publication, omits all reference to "fanciful designs" and the like. Mr. McGuire, who is a lawyer, and hence accustomed to special pleading, here makes use of it, unconsciously, no doubt, but, nevertheless, it is a little hard for one who

³ *Brevis Narratio*, Book II, plate xx, Frankfort, 1591, published by Jacob Le Moyne." [*sic.*]

is conducting a scientific discussion with Mr. McGuire, to have him make use of a witness on one occasion to demonstrate something he wishes to demonstrate and then, afterward, to impeach the reliability of this very witness in order to try to discredit something else that it suits Mr. McGuire to discredit.

I wish to point out here, since I am on the subject of special pleading, that in his "closing remarks," Mr. McGuire, misquotes me. Mr. McGuire says: "but, to quote Mr. Moore's words, 'relying on proofs, historical, technological and of association' * * *."

My words were, as may be seen on page 42 in these papers, "relying on proofs—historical, technological, chemical and of association."

Mr. McGuire suppresses the word "chemical." While Mr. McGuire may not wish to take up the chemical issue with me, it seems hardly fair to eliminate the word from a quotation taken from me.

As the reader is aware, Theodore De Bry published a great number of "Voyages," divided into "Greater" and "Lesser." Sabin's criticism is a general statement and is, no doubt, exact in regard to the plates of most of these works. In the case of Part II of the "Voyages," which describes a Huguenot expedition to the St. John's river, Florida, the illustrations were furnished by Le Moyne, an artist and an eye-witness, and presumably the plates are much more reliable than those in other publications by De Bry. The reader will kindly bear this in mind and not reject as valueless the plates from De Bry, reproduced in my paper, and the drawing "after De Bry" given by Mr. McGuire in his memoir on pipes.

It is sure that the drawings made by Le Moyne must have been accurate in many respects, especially as to the ornaments worn by the aborigines, for how otherwise could his drawings coincide so exactly with the copper plates found by me in the mounds where the aborigines used to live?

Mr. McGuire says: "I would call attention to plate 42, one of the series in this same volume, which represents an Indian standing over a French prisoner [?] in the act of killing him with *an axe*, the axe having *an eye* to it and a *helve in the eye*. Therefore, to follow Mr. Moore's line of argument, we should believe that the natives possessed such axes prior to the arrival of the whites, although we have Laudonnière's assertion that he compensated the natives who sent him presents, with axes, knives, glass beads, and mirrors."

I think Mr. McGuire is in error in attributing to me the line of argument that he does. I do not assert that everything shown in Le Moyne's plates was worn or carried by the aborigines. Europeans, sailing vessels, wheel-lock guns, steel swords, helved axes, are shown in these plates, but I do not maintain that all these things were of aboriginal origin. Plate XLII, cited by Mr. McGuire, shows a French soldier (not a prisoner, by the way), who has gone in a dug-out with two Indians, on a journey, carrying his effects with him. The axe seized by the savage to slay him with belonged, of course, to the Frenchman. Nowhere in the plates are the aborigines shown possessed of these axes; on the other hand, in Plate IX, a Frenchman is using this kind of axe to chop down a tree.

European axes are found with intrusive burials in the mounds, but never have I come across them at any depth from the surface.

It is well known that while the expeditions of Narvaez and of De Soto were unsuccessful in their quest for the precious metals, plates of gold and of silver were seen on the aborigines along the St. Johns river by the French who came in 1562-4, about a score of years later than De Soto. Now, the presence of these metals, probably obtained from the wrecks of vessels, might prove confusing to some when considering the origin of the ornaments of metal which the testimony of the mounds and the pictures of Le Moyne show to have been worn by the aborigines along the St. Johns. It would be a mistake to attribute the provenance of the silver and gold and that of the copper to a common source.

While, doubtless, the Huguenots saw a limited amount of gold and of silver on the savages, the amount reported was undoubtedly "an exaggeration of the facts, common to the European mind in that age." Probably everything that glittered was gold to the Frenchmen. Masses of lead sulphide, at the present time so frequently found in the mounds, were doubtless sometimes taken for silver, and burnished copper for gold, as occurred in the case amusingly told by Bernal Diaz of the six hundred polished copper axes bartered for by the Spaniards in the mistaken notion that they were of gold.

If the precious metals ever became abundant among the aborigines in Florida, it is hard to account for their comparative absence from post-Columbian mounds and superficial burials in that State, since iron, glass, lead, brass, etc., are met with in them in plenty.

Among the many scores of mounds I have dug down in Florida,

I have met with gold but once,¹ and that superficially. Silver I have encountered several times, always in low mounds or near the surface of larger ones. I exclude from this category, however, sheet-copper coated with silver, which I have found under circumstances, in my opinion, showing it to be of pre-Columbian deposit.

To my first investigation of the Grant Mound, I devoted six days with sixteen men to dig. The next season I demolished the mound with forty-three men digging thirty days.

To my two investigations of Mt. Royal, I gave thirty-nine days with an average of twenty-six men.

In neither of these mounds, which were at, or near, the homes of Saturioua and Outina, respectively, was gold or silver met with by me, or, as I have before stated, was any object surely of European origin, found.

It would seem likely, then, that most of the metal ornaments seen on the savages by the French were of copper. If such ornaments of silver and of gold as were seen got into the mounds situate at the places where the chiefs lived, it was probably about the period of discontinuance of these mounds as burial places and the ornaments, buried superficially, were ploughed away, in the case of the Mt. Royal Mound, at least, which had been under cultivation before we dug it; or, likely enough, the mounds in question were no longer in use when the Frenchmen came.

At all events, the ornaments figured by Le Moyne, of whatever metal or metals they may have been, were of the same type as the copper ones found from the bottom to the top of the mounds situate where the chiefs described by the Frenchmen were, and must have been patterned after these ornaments of copper, and these ornaments of copper were pre-Columbian, for it is surely inconceivable that ornaments of this type could have had time to spread over the Peninsula and, after that again, mounds of the kind I have described could have been built from the base up, all within the thirty odd years that intervened between the landing of Narvaez and the coming of the French. Besides, these ornaments are of native copper, which the Europeans did not have, and no object of European provenance was found with them.

Mr. McGuire says: "having made an exhaustive study of abo-

¹ In this connection the reader is referred to a paper by my good friend, the late Andrew E. Douglass, "Description of a Gold Ornament from Florida." *American Antiquarian*, January, 1890.

iginal American pipes, or perhaps I should say, primitive pipes, there can surely be no objection to my drawing deductions from personal experience, especially where it is confined strictly to a line along which I am supposed to be able to form them intelligently."

No one can object to an intelligent deduction. The point criticised was that Mr. McGuire, in his memoir on pipes, quoted the presence of copper with pipes as a proof of their modern origin, and then, in his reply to my paper, cited the presence of pipes in a mound with copper to show that the copper was European. This is circular ratiocination.

Mr. McGuire's opinions as to pipes are shared by few, if any. There are those who think that as Mr. McGuire, by his own showing, failed so utterly in his experiments with copper, he may not have been more successful in his efforts as to pipes.

As to what Mr. McGuire says in reference to mound pipes, that there are on some of them flat surfaces, or facets, and that on these facets appear series of straight lines parallel and equidistant, and that he can imitate these lines with a file only, and cannot reproduce them with any stone tool, it can only be said that while Mr. McGuire has, for a considerable period, looked into such matters, he may, nevertheless, be mistaken. There may be archaeologists who accept Mr. McGuire conclusions, but a careful search has failed to locate them. Mr. McGuire's statement as to pipes may have passed unchallenged in print for a time for the same reason that his statements that copper, that a tool of copper, that sheet-copper, showed European influence, remained unnoticed for a period, because no one had the time or energy to take the matter up, or because some did not take the matter seriously in view of the overwhelming proofs of association connected with mound pipes and of association and analysis connected with copper.

After a period, Mr. Fowke,¹ a man of wide field experience, which counts for so much, and of museum experience, too, went on record as follows: ("Archaeological History of Ohio," pg. 588) "Unless it bears at the same time other indications of modern work, there are no scratches at all resembling the mark of a file on any so-called Indian relic in the [National] Museum, which may not be produced with a piece of hard, gritty sand-stone. Besides, exactly similar marks occur in parts of the specimen which cannot be reached with either the round or the flat face of a file."

¹ Mr. Gerard Fowke, the author of "Stone Art," Thirteenth Annual Report, Bureau of Ethnology, Washington, D. C.

Mr. McGuire says: "Mr. Moore's assertion that the copper which I suggest was acquired by the Indians through trade and by shipwreck was sheet-brass as he can assert 'from personal experience, often repeated,' brings into the controversy the assertions of Hariot, Smith and others that the Indians so traded, and further, examples of copper kettles in the National Museum, of European make, worked into ornaments, are too numerous to admit of doubt as to their existence."

Mr. McGuire, in quoting me, leaves out the word "much." I said, "I can only repeat that much of what has been called sheet-copper, found with late burials, is, in reality, sheet-brass, and as to this I can speak from personal experience often repeated." * * * I again assert this. I believe that some early writers wrote loosely when speaking of copper and failed to distinguish between copper and brass, just as certain writers at the present time, including Mr. McGuire and Doctor Thomas, fail to distinguish between copper and brass, and call Indian kettles "copper kettles," while in fact, practically all of them are of brass. In some foreign tongues little distinction is made between copper and brass. The Italian *rame* means either. In some French dictionaries the word *cuivre* is given as the equivalent of copper or of brass. Translations of early chronicles may be at fault at times. Some early writers, however, distinguish between copper and brass, including Underhill, to whom reference will be made later.

Wood, in his "New England Prospect," published in 1634, states that the Indians obtained brass from the English for their ornaments and arrowheads.

I have found sheet-brass in the mounds, with intrusive burials, ten times as often as I have found European sheet-copper. Brass is cheaper than copper, and it is only natural to suppose that those providing themselves with material for gift or for barter would, as a rule, select the less expensive.

Mr. Willoughby, writing from the Peabody Museum, Cambridge Mass., says, "by far the greater number of metal objects from the New England graves are of brass."

Mr. David Boyle says, "Similarly, we have in our collection [Provincial Museum, Toronto] small beads which were called in a familiar way 'copper' beads, but which are really made from small strips of the disused brass kettles."

But why multiply authorities? It is evident that my conten-

tion is established—that much of the so-called sheet-copper is brass. Mr. McGuire, himself, as we shall see later, confounds sheet-brass with sheet-copper. Now, whoever saw embossed or engraved work on brass similar to that found on copper in the larger mounds?

Mr. McGuire joins issue with me as to whether the so-called copper kettles are of copper or of brass. Let us settle that matter, right here.

Ten years ago, when I caused a great number of analyses of copper to be made, I vainly sought for a copper kettle found with an aboriginal burial.

The Academy of Natural Sciences of Philadelphia has but one Indian kettle. It is brass.

Mr. David Boyle, Superintendent of the Provincial Museum, Toronto, Ontario, than whom no greater authority exists on these matters, writes: "There can be no doubt at all that most, if not all of these pots, are brass. Any difference I can see is merely one of degree in brassiness."

William M. Beauchamp, S.T.D., whose work is too well known to call for reference here, has written an exhaustive memoir entitled "Metallic Implements of the New York Indians."¹ One of the parts into which the book is divided has for title, "Brass Kettles." We read how La Salle wanted 2000 pounds of brass kettles at Fort Frontenac.

All the kettles figured in this memoir are of brass. Copper kettles are not even mentioned in the index, though allusions to kettles of brass are abundant.

Mr. C. C. Willoughby writes that, excluding stored collections, as to which he does not wish to make positive statements, there are in the Peabody Museum four Indian kettles, one from Michigan, one from New York, two from Rhode Island. All are of brass. Mr. Willoughby cites Underhill's narrative of the Pequot War wherein it is told how the Indians broke up their *brass* kettles "to make their arrow-points."

A careful examination has shown that there is but one copper kettle in the National Museum; the rest are brass, though Dr. Cyrus Thomas in his "Report on Mound Explorations," Twelfth Annual Report of the Bureau of Ethnology, speaks only of copper kettles being there.

¹ New York State Museum, Bulletin 55, Archaeology, 7, published by the University of the State of New York.

As to the "examples of copper kettles in the National Museum of European make, worked into ornaments," as to the number of which Mr. McGuire speaks, it can only be said that a careful search made in the National Museum, where every facility was offered by the authorities of the Museum, and an official of the Museum was present, failed to show any of the ornaments of which Mr. McGuire speaks, though beads of sheet-brass and cones of sheet-brass are there. Such copper ornaments as were seen gave no evidence whatever of having been made from kettles. This assertion of Mr. McGuire is simply a mere statement made by him. Presumably, Mr. McGuire has taken for sheet-copper the sheet-brass ornaments in the Museum, and thus himself affords a proof of my contention.

Finally, as a proof of sincerity on my part, I now make this offer to Mr. McGuire. I will allow Mr. McGuire to name a committee of three experts who shall take testimony as to whether the vast majority of Indian kettles are not of brass, the loser in the decision to make a printed acknowledgment that he has been arguing about a subject of which he knew nothing.

Mr. McGuire speaks of numbers of objects found in the mounds, which objects I admit are undoubtedly of European origin, such as glass, medals, crucifixes, etc., etc. During my investigations, I have found superficially or in smaller mounds many scores of objects of European provenance—even combs. Until quite recently mound investigation has not been carried on so carefully as it should have been, and the fact was not recognized that it was just as important to state in records of mound work exactly what part of the mound the object came from as it was to describe the object itself. Too frequently all objects met with in a mound have been boxed together and labelled simply as coming from a mound in such or such a locality, and frequently, unfortunately, erroneous deductions have been drawn therefrom by "desk-workers."

Inexperienced mound workers, also, may report most curious associations of objects, for it is not for every one to distinguish the intrusive burial or the pit dug and filled in by recent explorers, or by seekers after treasure. These remarks apply to shell-heaps equally as well as to mounds. Of course, the existence of some post-Columbian mounds and shell-heaps is admitted, but one swallow does not make a Spring, nor can one auk make post-Columbian a whole series of mounds and shell-heaps.

In my answer to Mr. McGuire I requested him to give the

names of such American archaeologists as shared his belief as to aboriginal copper. My paper, read at Washington, had for title, "Sheet-copper from the Mounds is not necessarily of European Origin." Mr. McGuire took the opposite side; that is, that sheet-copper from the mounds is necessarily of European origin, and he has gone on record as to sheet-copper and even copper in general.¹ Therefore, those who share Mr. McGuire's opinion believe sheet-copper to be, of necessity, of European origin.

Mr. McGuire has named Doctor Cyrus Thomas, as an endorser of his views, and says: "I submit that Dr. Thomas' name will satisfy Mr. Moore's request and be an answer upon which both American and European archaeologists may ponder."

They surely will, for Dr. Cyrus Thomas, whom Mr. McGuire cites, says, page 711 of the "Annual Report of the Bureau of Ethnology, 1890-91," "as a matter of course no one denies that the mound-builders made implements and ornaments of native copper and frequently hammered this copper into thin sheets with the rude implements of which they were possessed."

Though these words *immediately precede* the quotation from Dr. Thomas given by Mr. McGuire, yet Mr. McGuire did not think it necessary to include them.

I marvel greatly that Mr. McGuire has not named the others whom he says share his belief as to copper. Mr. McGuire explains that he does not wish to involve them in a controversy. The present discussion as to copper, carried on with the best feeling on both sides, must inure to the benefit of science, and those who fear, or are ashamed, to assert their views in the matter must be faint-hearted supporters indeed. Gladly will I publish, at Mr. McGuire's request, a list of those archaeologists who do *not* share his opinions as to copper. These gentlemen are in no wise timid as to putting their views on record.

It is true Doctor Thomas does not believe in the aboriginal origin of the Etowah plates, because he thinks he has distinguished on them marks of European tools, which, parenthetically I may say, others, including many of his co-workers in the Bureau, have failed

¹ "The contemporaneity of metal in the mounds, especially copper" * * *. McGuire [to show a modern origin for certain pipes].

"Objects of undeniably European manufacture such as an implement of copper" * * *. McGuire.

"The sheet copper," * * * [to prove European provenance]. McGuire.

to see, and in his memoir, to which I have already made reference, in speaking of thin and evenly made sheets of copper, says (p. 711): "A careful chemical and microscopical examination of the various specimens might possibly settle the point; however, as this has not been done, we must, for the present, rely upon inspection."

When my investigation of mound copper, viewed from a chemical standpoint, with very many analyses, appeared, after this suggestion from Doctor Thomas, in the second part of my "Certain Sand Mounds of the St. Johns river, Florida," (The Journal of the Academy of Natural Sciences of Philadelphia), I sent a copy to Doctor Thomas, with whom I had had considerable pleasant correspondence before.

Doctor Thomas replied in a very kind way as to my book, but stated he did not feel competent to judge of the chemical evidence presented.

Under date of January 11, 1895, I wrote Doctor Thomas, offering to have made any tests he would suggest. I suggested that the chemists of the Geological Survey might take the matter up and closed my letter with, "I am also willing to appoint a representative, an expert on the analysis of copper, to conduct an analysis with a representative of the Survey, and each side may see the others method of work and upon what tests his conclusions are based. We are all anxious to get at the truth, and the sooner we can do so the better."

I received no reply to this letter, although Doctor Thomas had been the first to suggest a chemical investigation.

In spite of the fact that Doctor Thomas had twice gone on record in print¹ as to his belief that the Etowah plates showed European influence, nevertheless, one would expect him, after the suggestion made by him, to accept my offer, if his want of knowledge of chemistry did not permit him to judge of the work that had already been done.

Incidentally, it may be said that Dr. Roland Steiner, the well-known archaeologist, who conducted the investigation of the Etowah mounds, disbelieves in the theory of a European origin for the copper found there. In the smaller of the two large mounds at Etowah, Dr. Steiner found an axe made of three pieces of copper beaten together. This axe is now in the National Museum as is also an implement with a square point, found in the mound by Dr. Steiner, which he believes was the very tool with which the repoussé work on the copper plates may have been done.

¹ "Twelfth Annual Report of the Bureau of Ethnology," and "The Story of a Mound."

It is also interesting to know that sheet-copper "from Grave A, Little Etowah mound, Georgia," furnished me by the late Thomas Wilson, Esq., while connected with the National Museum, proved, upon analysis,¹ to be pure native copper.

Prof. W. H. Holmes recently furnished five specimens of copper from the United States National Museum for analysis by Prof. Harry F. Keller, Ph.D.

One of these, marked "No. 170,803, Fragment of thin sheet-copper, showing repoussé work. Mound C, Etowah Group, Barton Co., Ga.," gave as metallic impurities silver and iron only, which impurities are to be looked for in all native copper.

Incidentally, the results of the other analyses are given here.

"No. 83,445, Fragment of spool-shaped ornament, Gunthersville, Marshall Co., Ala.," showed silver and iron as metallic impurities and "a faint trace of arsenic."

Here again we have native copper.

The other three specimens of copper were sent as being undoubtedly of European provenance.

"No. 59,609, Fragments of cylindrical copper beads, Indian grave, Eastport, Me." The impurities were silver, lead, antimony, arsenic, iron, nickel.

"No. 22,060, Piece of copper, Casco Bay, Me.," yielded as impurities silver, lead, antimony, arsenic, bismuth, iron, nickel.

"No. 13,519, Fragment of sheet-copper, Indian Grave, Harpswell, Me." Metallic impurities were as follows: silver, lead, antimony, arsenic, bismuth, iron, nickel.

The percentages of lead, antimony and arsenic present in the three specimens of copper of European provenance were strikingly heavy.

There is another matter of which I wish to speak.

Since preparing my paper for the "Anthropologist," I have spent over three months in Florida, constantly engaged in mound work.

I met with metal in but two mounds, excluding one small bit of copper.

In a large mound near the great shell-heap on the Crystal river, Citrus county, I found human remains in 226 places, and these burials represented a far larger number of skeletons than the figures

¹ Given in my Part II, "Certain Sand Mounds of the St. Johns River, Florida."

given, as bones sometimes lay in masses. There were also great numbers of objects including earthenware vessels, tobacco pipes, pendants of stone and of shell, shell cups, etc., hundreds in all. Among the pendants were twelve hammered out of native copper, all patterned after pendants of stone or of shell, present in the mound. There were also in the mound several ornaments of sheet-copper and three pairs of embossed ear-plugs of sheet-copper, some overlaid with sheet-silver. In the entire mound was no object distinctly of European make.

A fragment of a fluted ornament of sheet-copper from the Crystal river mound was submitted to Dr. Harry F. Keller, Ph.D., for analysis. Doctor Keller reported the ornament to be "certainly made from the native metal: a very searching qualitative analysis of the cleaned specimen gave only silver and iron as metallic impurities and demonstrated the entire absence of lead, arsenic, antimony and zinc."

The other mound in which objects of metal were present was near the Chipola river, a tributary of the Apalachicola river, in northwest Florida.

In this mound, which was about 5 feet high, glass was present, even coming from a grave below the base, so that the mound was distinctly post-Columbian. In the grave referred to were two metal discs, one with two perforations for suspension, the other with a single one. There was in the mound, in addition, another disc and fragments of a fourth. These discs, tested by Professor Keller, proved to be *brass*. The discs bore no ornamentation, being simply circular sheets of metal.

It would hardly be possible better to illustrate my contention as to copper and as to the association of objects in the mounds than has been done by the results afforded by the investigation of these two mounds, which will be fully described in a memoir to be published by the Academy of Natural Sciences of Philadelphia, at which institution is all the copper discovered by me in the southern United States.

So far as I can see, this question as to aboriginal copper is about as follows:

1. As to the results of chemical analysis, seemingly so conclusive, Mr. McGuire has nothing to say. The reader will kindly bear in mind, however, that ignorance as to chemical tests on the part of Mr. McGuire does not eliminate chemistry from the discussion; the

only factor Mr. McGuire's want of knowledge as to this subject can eliminate is Mr. McGuire himself.

2. That Mr. McGuire ignores these most valuable proofs of association; that is, that sheet-copper and sheet-copper embossed are found in very many mounds which contain no objects distinctly of European provenance.

3. That Mr. McGuire places his sole reliance, outside his personal opinion, on the allegation that certain early chroniclers fail to mention embossed sheet-copper. We have the testimony of De Bry that such copper must have existed among the early aborigines. Mr. McGuire, however, attempts to discredit De Bry, whose testimony Mr. McGuire was ready enough to make use of in his own publication. As to Hariot, Smith and others, in whose writings reference is not made to embossed sheet-copper, it can be said that these men were probably not cultivated to a point to attach importance to whether shining plates of copper were embossed or not, and hence did not refer to embossed work. Moreover, this testimony of omission is negative testimony. Should Mr. McGuire remind us that the non-discovery in many mounds of objects surely of European provenance, also is negative testimony, the answer would be that it is negative testimony of a very different sort. It is not admitted that early writers, rough-and-ready-men, went into each and every detail of aboriginal decoration in copper. On the other hand, it is admitted that the aborigines buried with their dead the belongings of the deceased. Mounds containing no objects of European provenance and post-Columbian mounds and graves which contain impure copper, brass, iron, glass, lead, etc., prove this by positive testimony. Therefore, where, in great numbers of mounds in whole districts of country no objects surely of European provenance are found, the fact that such objects were not possessed by the makers of these mounds is generally admitted to be almost conclusive.

Under any circumstances, the best negative testimony, which Mr. McGuire's is not, is a poor weapon with which to combat positive testimony. Mr. McGuire's inferior negative testimony is opposed by far stronger negative testimony from the mounds, and this negative testimony from the mounds is, in addition, clinched by the results of chemical analysis, which is positive testimony indeed.

4. That Mr. McGuire abandons his former contention as to copper in general, and even as to sheet-copper, which now is only "suggestive" of European provenance, and makes a final stand

that evenly made ornaments of sheet-copper, embossed, certainly show white influence.

It comes down then, practically, to a question of Mr. McGuire's personal opinion.

In estimating the value of the opinion of any one, it is well to consider the means by which this opinion was reached. Was it attained through experiment? If so, is the record of the experimenter such as to inspire confidence in his judgment? Mr. McGuire himself, in these papers, has told us how signally he failed in his attempts to hammer out native copper. This failure, in connection with Mr. Willoughby's experience, is not of a character to inspire us with confidence in Mr. McGuire.

We should consider also the mental bent of the person whose opinion is advanced. Has he shown in the past a tendency to bring forward startling and untenable theories? If so, he is likely to do so again. Mr. McGuire's belief in the European origin of tobacco-pipes is well known. In addition, he is the author of "On the Evolution of the Art of Working in Stone,"¹ in which it is contended *that implements of polished stone came into use before implements of chipped stone were used.* This theory created a sensation, but it is unsupported by facts. Are not Mr. McGuire's theories of copper on a like basis?

To put matters to a test, and as a proof of sincerity on my part, I will make this offer to Mr. McGuire :

Mr. McGuire may name two well-known experts in chemistry, and I will name one. These gentlemen may make extended analyses of early European copper, of native copper, and of sheet-copper ornaments found other than superficially in mounds in which no objects of distinctly European provenance have been met with.

If it is decided by this board that embossed copper from the mounds is not native copper and is copper the result of early smelting processes in Europe, I have lost, and the expenses of the commission will be borne by those who believe in the aboriginal origin of such mound copper.

But as Mr. McGuire and Doctor Thomas have allowed to go unnoticed all offers as to chemical tests of copper, made by me to them in the past, I will go still farther. I will agree to any reasonable set of chemical experiments suggested by Mr. McGuire or by Doctor Thomas, who, I suppose, might be called Mr. McGuire's

¹ "American Anthropologist," Vol. VI, July, 1893, p. 307, *et seq.*

semi-endorser. The want of chemical knowledge on the part of these gentlemen may not serve them as an excuse for the non-acceptance of my offer. There are in Washington, chemists who, though not, of necessity, endorsing the views of Mr. McGuire and Doctor Thomas as to copper, know these gentlemen and think highly of them personally, and must regret to see them, as I regret it, at the losing end of a position to which the description given to a contest between Romans and barbarians so aptly applied, *i. e.*, "where one side strikes and the other stands and bleeds." These chemists, surely, will frame, at the request of Mr. McGuire and Doctor Thomas who was, himself, the very first person to suggest that chemical tests as to copper be made, a series of accurately worded suggestions for chemical tests, the results of which must satisfy, save those who will not see, all who desire additional tests, if there be any such.

If, however, no chemical tests of copper are proposed by Mr. McGuire and Doctor Thomas, and these gentlemen continue a Parthian method in science, where one shoots off statements and then flees from a demonstration of facts, then these gentlemen must be relegated to the class represented by the worthy old lady in the story who said she had what was a great deal better than evidence, and that was her own opinion.

GENERAL DISCUSSION

REMARKS BY F. W. PUTNAM (PRESENTED IN HIS ABSENCE BY
ROLAND B. DIXON).

There is exhibited in the Peabody Museum of Harvard University a large collection of objects obtained from an altar in the great mound of the Turner group in Ohio. This mound was unquestionably of very considerable antiquity; and of the thousands of ornaments found on the altar, not one is in any way suggestive of contact with white people. In the collection there are several natural nuggets of native copper, others partly flattened by hammering, and several hammered into sheets of varying thickness. The copper ornaments were evidently made by hammering and cutting the copper into the desired shapes. This lot of copper illustrates the method of working the native copper by hammering. The experiments that have been made in the Museum show that native copper can be thus hammered with stones. Not only does this lot of specimens prove the hammering of native copper, but with these copper objects there were found also pieces of meteoric iron, native silver, and a few bits of native gold that had been made into ornaments by first hammering the metals into thin sheets. One large piece of meteoric iron was evidently in its natural form, and another small piece had been flattened by hammering. Experiments have proved that this iron can be hammered with a stone. Celts of copper and of meteoric iron, made by hammering, have been found in other prehistoric mounds and are exhibited in the Museum. The question of making ornaments and implements of native copper by hammering, I had considered as settled twenty years ago, at the time my observations on the subject were first published. Moreover, Mr Moore's research relating to the analyses of various copper objects found in the mounds is conclusive as to the origin of the copper.

REMARKS BY GEORGE A. DORSEY

I have been familiar with the Hopewell copper for many years have worked over it a great deal, have done something myself in regard to hammering copper with primitive tools. While still a student at Cambridge I satisfied myself that all the copper from the Hopewell mounds was of Indian origin, an opinion which I still hold.

ARE THE HOPEWELL COPPER OBJECTS PREHISTORIC?

By WARREN K. MOOREHEAD

At the Washington meeting of the American Anthropological Association, held conjointly with that of Section H of the American Association for the Advancement of Science, I read a brief paper on the Hopewell copper objects, and it is now my wish to present a more extended communication on the subject.

Mr Clarence B. Moore, whose valuable work in southeastern United States is so favorably known to all who are interested in American archeology, has recently called my attention to two sentences in my review of Mr Fowke's *Archæological History of Ohio*, published in the *American Anthropologist* (volume iv, No. 3), which might be regarded by some as evidence that European objects were found in the Hopewell mounds of Ohio. If any one so construes these sentences, he gives to them an interpretation exactly the opposite of that which I wish to convey.

When the land on which the Hopewell group of mounds is situated was cleared, about the year 1800, it was covered with a heavy forest growth of oak, walnut, etc., but on the upper one of the two terraces of the enclosure the growth was largely of oak. Evidence based on the age of timber is very unsatisfactory, and one cannot say with certainty whether the largest trees growing from the mounds were two hundred or four hundred years of age. The fields have been cultivated for many years, and the height of each tumulus has been reduced and the diameter greatly extended. Our best evidence as to the antiquity of the mounds, therefore, is obtained from the excavations. These evidences are :

First. Five or six of the mounds contain peculiarly shaped altars of burnt clay. These are confined to southern Ohio and are not mentioned by the earliest travelers who witnessed the southern Indians building mounds. The altars here referred to are those of the type described by Squier and Davis and in my own writings,

and not those formed of blocks of wood, squares of stone, and similar structures.

Second. The presence of chalcedony from Flint Ridge. So far as can be ascertained the Flint Ridge material was not used in historic times.

Third. Substances not native to Ohio. In reviewing Mr Fowke's book I used the term "foreign" in allusion to objects found outside of Ohio; if I had been writing on the United States in general, I should not have employed the word, for in matters of such importance as the antiquity of the Hopewell group, one cannot be too careful in the use of explanatory terms. In no other mounds have so many different substances been found. Without going into detail I may mention as having been unearthed during the Hopewell excavations, copper, mica, obsidian, galena, a fossil, sea-shells, sharks' teeth, and Tennessee flint. Cannel coal, Flint Ridge material, and graphite slate were also found, but these cannot be considered to have come from a distance exceeding eighty or a hundred miles. Excepting the copper, these materials in themselves, whether obtained by barter or by travel, might not be evidences of antiquity, but the copper alone is sufficient to prove the pre-Columbian origin of the Hopewell group. The careful analysis made by Mr Moore and published some years ago in his "As to Copper from the Mounds of the St. Johns River, Florida," showed that copper not only from other mounds but that from the Hopewell group contained a higher percentage of *pure* copper than the European commercial copper of two centuries or more ago. This cannot be gainsaid. The presence of half-hammered nuggets in the Hopewell effigy mound was, to my mind, conclusive evidence. These nuggets do not present the smooth surface of copper beaten with an iron hammer, nor are the forms regular. They have undoubtedly been rudely shaped with stone hammers, showing a process but begun. In June last I visited Wisconsin and was astonished at the amount of drift-copper occurring on the surface between Two Rivers and Princeton, a distance of about one hundred miles. I obtained a hundred and thirty-eight pounds of specimens of varying sizes, some of which have been partly worked by man. The hammered pieces were larger than those found in the Hopewell group. None of

them was cut from European commercial bars; all are from the drift or were mined in the Superior-Michigan region.

Can the advocate of the modern origin of all our mound-groups, in which the highest culture is in evidence, claim that French, Spanish, English, Dutch, or American traders obtained metal carrying a higher percentage of copper than the European copper of the times in which they lived, worked some of it into such strange symbols as the swastika and many cosmic figures and combinations, or into thin sheets; made immense copper axes (one of which weighed nearly thirty-eight pounds), and long bar-shaped objects of solid copper weighing from ten to thirty pounds, such as has been found in Wisconsin; and after doing this skilful work have hammered with stones some ill-shaped nuggets and traded these masses of varying forms, representing many stages of workmanship, to the natives to be placed by them in the mounds? Is there any field evidence of such a contention? Can we logically conceive of an illiterate trader (for not one in a dozen of the early traders could either read or write) knowing aught concerning the swastika or the cosmic symbols? It is well known that traders did carry brass, beads, kettles, and the like into the Indian country; but imagine a trader visiting the Hopewell group with sixty-eight copper axes in his possession, ranging from four ounces to thirty-eight pounds in weight! And there is no European or American axe of white man's make of the peculiar form of the Hopewell specimens.

The designs in sheet-copper are so intricate that up to the present no one has been able to correctly interpret them. Professor Putnam and Mr Willoughby have published a paper on these strange designs which, up to the present time, is the only attempt at explanation that has been made.¹ To assert that any of the objects found during the Hopewell explorations are of European origin, or that the art products of these mounds were inspired by a knowledge of the white man's methods, is to assume a position, it appears to me, directly contrary to that which the facts warrant.

There is another strong argument in favor of the pre-Columbian origin of the copper objects from the Ohio mounds. La Salle's chroniclers are silent in regard to the Lower Scioto region, and it is

¹ "Symbolism in Ancient American Art," *Proceedings of the A. A. A. S.*, 1896.

not probable that any explorer or trader visited the Ohio valley prior to La Salle's time. If the villages of this section had been occupied by the Indians in 1669, when La Salle conversed with the Shawnee prisoner, he surely would have mentioned them.

Let us consider the field evidence again. An inspection of the village sites on the Scioto and its tributaries, where the Shawnees lived for so long, reveals very little village refuse. Save at Frankfort (in Ross county, six miles from Hopewell), there are no mounds or other works near the village sites. Now, curiously enough, the Frankfort site (Chillicothe-on-Paint¹) was to the east, and extended over the edge of a fortification of pre-Columbian character. There were four mounds in or near the enclosure, and it is well known that the Shawnees did not use them, and in these mounds we found the usual Lower Scioto copper objects, etc., when we opened them in 1888 and 1889.

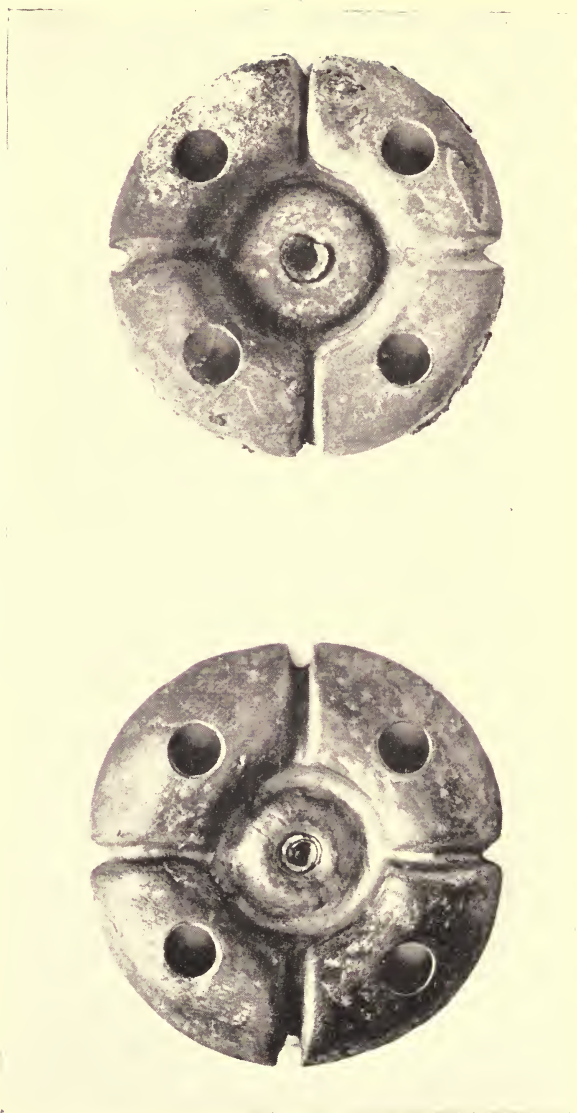
The Shawnees buried their dead in trenches and graves in the eastern part of the town, and as these graves have frequently been opened, an excellent opportunity has been afforded of contrasting the modern with the pre-Columbian mortuary accompaniments. In these trenches and graves glass beads, brass kettles, and iron knives have been found with the human remains; in the mounds there were two small altars, pyrula shells, pipes, etc.; but in the graves no pyrula shells, no monitor pipes, no copper, no slate ornaments were found.

On the known historic sites in southern Ohio so little is found that, were it not for our records of Logan, or Tecumseh, or Cornstalk, we would be inclined to conclude that roving hunters incapable of producing men of ability lived there. The great Illinois sites mentioned by La Salle are covered with the usual village débris of bone, shell, stone, and clay, but not in such quantity as at Madisonville, at Two Rivers (Wisconsin), or at Highbys and other points on the Scioto. These Scioto sites not only display evidence of long occupancy by a few people or of a large population for a limited period, but they are surrounded by or are in combination with great enclosures or mound-groups. In them the art is not

¹ Chillicothe means "Place of residence." There were several towns bearing the name — Old, Upper, Lower, etc.

confined to the scanty scrapers, rude hammers, and knives or axes of the Shawnee and Illinois sites. On the contrary, the art is the best found east of the Pueblo country. If these tribes were living when Sir John Hawkins' men passed through the middle of the continent, about the year 1570, on their way from Nicaragua to Cape Breton, supposing that the sailors traversed the Ohio valley, they would have left us a glimpse of these Scioto sites. But the book on their wanderings is, of course, silent on the subject. It mentions the Iroquois, but that is about the only tribe we can recognize with certainty

Dr Cyrus Thomas has said that the Shawnees came to Ohio in times of antiquity. I do not believe he has determined the date of this move—if he has, I court correction. That their village was alongside one of the earth enclosures, yet totally distinct from it; that the art products of the two are quite dissimilar—one being crude, the other more advanced,—are further evidences, to my mind, of the pre-Columbian origin of the mound-groups and their contents in Ohio, Kentucky, and Indiana.



PRIMITIVE COPPER WORKING

a, Part of a copper ear-ornament from a mound of the Hopewell group, Ohio. *b*, Modern copy of the above made by primitive processes.

PRIMITIVE METAL WORKING

By CHARLES C. WILLOUGHBY

Apropos of the discussion at the recent meeting of the American Association at Washington of the sheet-copper objects from the mounds, a brief account of an experiment in native copper working with primitive tools, made by the writer in 1894, may not be without interest. Only two trials were made to form sheets from native copper, both of which were successful. The first sheet produced was from a nugget from an altar of an Ohio mound, the second was from native copper from the Lake Superior region. But one attempt was made to form an ornament from a sheet of copper thus produced, the result of which is shown in *b* of the accompanying plate XI. The upper figure (*a*) of the same plate represents half of an ear-ornament from an extensive deposit of copper objects in a mound of the Hopewell group, Ohio. Although larger and more elaborate ornaments were found, this object was chosen for reproduction because its construction from a nugget of native copper involved all the various processes necessary for making any object of metal from these mounds—hammering, annealing, grinding, cutting, embossing, perforating, and polishing.

The experiment was carried out upon a sea-beach strewn with water-worn stones of all sizes. Placing upon a smooth stone a piece of native copper from the Lake Superior region, and using an oval water-worn stone as a hammer, the copper was carefully beaten. A few blows sufficed to show the tendency of the copper to crack along the edges as it expanded. This tendency was overcome by annealing. It was only by careful hammering and repeated annealing that the mass was formed into a thin sheet. When the sheet had attained the required size it was ground to a uniform thickness between two flat stones, the work being hastened by the addition of fine sand.

The sheet was cut into circular form by incising partly through the copper with sharp flints and breaking off the superfluous metal.

The rough edges were then ground smooth on stones. As the four disks forming the pair of ornaments which served as a pattern were remarkably alike in size and contour, and appeared to have been made over the same mold, a modern form of the required shape was constructed from a piece of driftwood by charring and scraping and cutting with sharp flints. Over this form the copper disk was molded by light hammering and by pressure, the burnishing and pressing tool being made from a splinter broken from a beef-bone found on the beach. During the pressing and embossing process it was necessary to anneal the copper several times in a small fire kindled upon the sand. The perforations were made by using a rudely chipped flint as a drill and reamer. The ornament was polished with fine sand, and afterward with wood ashes.

The remarkable objects wrought from copper, silver, and meteoric iron from the Turner and Liberty groups, Ohio, on exhibition in the Peabody Museum at Cambridge, and those from the Hope-well group in the Field Columbian Museum at Chicago, should be carefully studied by all students interested in primitive metal working. These collections include nuggets of meteoric iron,¹ copper, and silver, most of them hammered to a greater or lesser degree. Among the finished implements and ornaments are celts and small cutting tools of copper and meteoric iron; head, breast, and other personal ornaments of copper, meteoric iron, and silver, and spool-shaped ear-ornaments of copper, some of which are overlaid with thin sheets of meteoric iron or silver. Symmetrical hemispheres of clay from half an inch to two inches in diameter were very neatly covered with thin sheets of meteoric iron, copper, or silver, the plate of metal on the flat side of the ornament having two perforations for attachment. Many symbolic designs cut from thin copper are also in the collections,² and to a student of the higher symbolism of the American Indian these designs are of themselves sufficient proof of the native origin of the objects.

A dozen or more small sheets of gold hammered from small

¹ For notices of meteoric iron from the Ohio mounds, with drawings and analyses, also for a brief account of the objects from the Turner group, see Professor Putnam's notes in *Peabody Museum Reports*, vol. III.

² See *Proceedings of the American Association for the Advancement of Science* for 1895, p. 302.

nuggets, but otherwise unworked, were taken from one of the altars of the Turner group and may be seen at the Peabody Museum. With this fact in mind, one should not too hastily question the statements of early writers that gold objects have been taken from the Ohio mounds. The more important evidences tending to show that the sheet-metal objects noted above are of prehistoric origin, may be summed up as follows :

1. The extensive prehistoric mines where native copper and silver were obtained.

2. The occurrences in the mounds of native copper and silver in nuggets, both worked and in their natural state, in company with ornaments from thin sheets of the same metals.

3. The ornaments from the Turner, Hopewell, and Liberty groups are strictly of native design.

4. The motifs of the symbolic forms expressed in the designs of many of the objects are the same as those occurring in objects of bone, shell, and stone throughout a large portion of America.

5. The simple art of forming sheets of copper, silver, and gold (as well as the more advanced arts of metallurgy) was known and practised by the cultured tribes of the Peruvian region in prehistoric times. It is not probable that any archeologist will claim that the thin sheets from which many of the prehistoric Peruvian ornaments were cut, large though some of them were, were rolled by machinery, or that any processes other than those of hammering, annealing, grinding, embossing, and perforating were followed in their construction.

6. Practical demonstrations have shown that any of the metal objects from the above mounds could have been made by processes known to the Indians at the time of their first contact with whites.¹

7. There is no evidence whatever of the European origin of the sheet-copper from the Turner, Liberty, or Hopewell groups, or that the mounds themselves are of post-Columbian date.

¹ That the Indians of the low grade of culture of the northern Athapascans understood the art of annealing is shown by a passage in Hearne's narrative of his journey to Coppermine river in 1771. Writing of the native copper of that region, he says: "By the help of fire, and two stones, they can beat it out to any shape they wish."—Samuel Hearne, *A Journey to the Northern Ocean*, p. 175.

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