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JOURNAL OF
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ORDINARY MEETING.*

THE PRESIDENT, SIR GEORGE G. STOKES, BART., M.P., P.R.S.,
IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBER :—Rev. Principal A. Cave, D.D., St. Andrew's, B.A., London, Hackney College.

ASSOCIATES :—His Excellency A. C. S. Barkly, C.M.G., Governor of Heligoland ; Rev. S. L. Dixon, London ; Rev. S. M. Mayhew, Vice-Pres. Arch. Assoc., London.

The following Paper was then read by the Author :—

THE DAWN OF METALLURGY.

By the Rev. J. MAGENS MELLO, M.A., F.G.S., ETC.

THE origin of Metallurgy amongst the races of mankind is involved in much obscurity. How was the art of smelting the metallic ores discovered? When, by whom, and in what country? These are difficult questions to answer. The Hebrew record in the Book of Genesis contains what appears to be the earliest written notice of the discovery, in the passage which says that one of the descendants of Cain, Tubal Cain, was "a sharpener or instructor of every artificer in copper [or, as it may be read, bronze] and iron." Lenormant and other writers tell us that the more recent results of archæological and philological study tend to show that metallurgy had been invented long before the dispersion of the sons of Noah, and that whilst they were acquainted with the use of metals, they had derived that knowledge from people who were anterior to, and even, it may be, unconnected directly with themselves. It is said that the cuneiform inscriptions "give us a glimpse of an ancient civilised Asia at a period when the Aryans and Semites were still living a pastoral life, an Asia which was in all respects non-Aryan."

* March 18, 1889.

One of the most prominent features of primeval civilisation was the use of metals. The Turks and the Mongols both say that their ancestors dwelt in a valley of the Altai Mountains, from which they extracted metal by means of fire. To the south of the Altai, and as far as Thibet, the manufacture of iron was carried to great perfection in very early times, even before the Chinese migration. In primitive Chaldea, peopled by Accadian tribes, we are told that there are traces of an ancient and abundant metallurgy, which influenced Assyria, Syria, and Arabia.

If we turn to Europe the results of archæological research show us that there was in this part of the world a gradual replacement of the stone implements of the Neolithic age by those of metal, and as far as Europe is concerned, the vast majority of the metal tools and weapons were at this period made of bronze, an alloy of copper and tin, containing, roughly speaking, on an average about nine parts of copper to one of tin.

The discovery and use of tin in the manufacture of bronze marks, it is well said, a great epoch in the history of human culture, for this metal is never found in a native condition. Its ore is dull, and non-metallic in appearance, having nothing about it to attract attention, whilst it is by no means widely distributed; a very considerable exercise of intelligence must have been required to discover its valuable properties. That the use of pure copper preceded that of tin appears to be beyond serious question, although, as compared with bronze, objects made of pure copper are strangely rare as compared with those of bronze, which was known in many parts of the world long before our era: it was in use amongst the ancient Egyptians certainly 2000 B.C. and probably even at a period far anterior to that. But before bronze was invented, it is only natural to suppose that there must have been a time, at any rate in copper-producing districts, when the unalloyed metal would have been employed. We should conclude this to have been the case even had we no actual proof of the fact; but proofs have gradually been accumulating, and Sir John Lubbock has very justly observed that "Copper seems to have been the metal which first became of real importance to man"; its ores are abundant, and they are easily smelted, besides which it frequently occurs in a native state, when its properties are manifest, for it can then be hammered into shape. The North American Indians utilised the great copper deposits about Lake Superior and made both implements and ornaments of this metal. Native copper was used in Santorin

before the destruction of the island by earthquakes. It is true that comparatively few objects made of pure copper have been found; they do not appear to have been carried far, as was the case with those of bronze, from the place of manufacture, but there is abundant evidence now that unalloyed copper was widely used. M. Ferencz Pulsky has stated that the most ancient interments in Hungary, as well as those in the North of Europe, contained only objects made of copper. But some of the most important evidence of the existence of what may almost be termed a Copper age, has been recently derived from the remarkable discoveries made by MM. H. and L. Siret in South-east Spain, between Carthage and Almeria. A number of pre-historic stations have been explored in this locality, in which were found not only numerous remains of the Neolithic age, but also those of a transition period, between the ages of Stone and Metal; which was followed by a third stage, in which both copper and bronze were simultaneously used, amongst a people who had evidently made very considerable advances in culture.

A brief sketch of some of the chief features of these discoveries will show the important bearing which they have in relation to the history of metallurgy in Europe and the condition of its primitive inhabitants.

The transition period,—characterised by an indigenous copper metallurgy,—was one in which the rude huts of the Neolithic men had been improved upon; and when regularly-built houses were constructed, houses built with stone walls, cemented with clay. In building them the rough boulders, from the neighbouring water-courses and hill-sides were used,

It appears, from the ground-plans of some of these dwellings, that they had turrets, perhaps of a defensive character, and the roofs were made of beams resting on wooden supports and covered with thatch. Thanks to the destruction of some of these houses by fire, several of those details have been made known to us; thus, the burnt clay, still bears traces of the thatch, together with the impress of the binding cords of plaited esparto grass. Some of the houses seem to have had an upper story. It has been observed that, even now, many of the peasants' huts in Almeria are constructed in a very similar way to that of these pre-historic dwellings.

It was amongst the ruins of these houses that a great number of metallic objects were found, and it is from them that we conclude that there then existed an indigenous metallurgy, implements of copper having been manufactured

on the spot in large quantities. In form, these early copper tools very closely resembled the contemporaneous stone implements, and were, doubtless, copies of these; and, it is to be noted, that these first attempts at metallurgy were not moulded, but were hammered into shape. Numerous implements, both of stone and of bone, together with other objects of a more or less ornamental character, were discovered in the same locality. Flint arrow-heads and knives were numerous; also polished celts, and wedges made of diorite, fibrolite, &c., and many bone awls and needles; a curiously-shaped bone object occurred which is said to resemble some found by Dr. Schliemann at Hissarlik, and which he thought were idols. Many perforated shells were found, together with specimens of *fusus* and *trochus* broken off at the apex, which may have been used as whistles, as similar shells are used to this day by the miners and hawkers of the district. Stone mills and pestles, also stone hammers, were discovered; for the most part, these were of a more advanced type than those found in the purely Neolithic stations. We may learn something too of the food of this early Spanish race from the remains of the goat, wild boar, and ox; and from beans, rye, barley, chestnuts, &c., which were dug out of the floors of their dwellings. The people were, probably, both pastoral and agricultural, and occasionally roamed over the district as hunters in search of the wilder animals.

But the chief feature of the age, and that which now most concerns us, is the evidence afforded as to the practice of metallurgy. This evidence is abundant. Cinders and slag, the ores of copper, both the blue and the green carbonate, lumps of metallic copper, and, finally, copper implements, show in the clearest way that the Metal age had now begun, in this part of Europe. The copper ores had been obtained from the neighbouring mountains, where they are still found.

Amongst the copper objects were triangular unbarbed arrow-heads, small awls, one of which was still fixed in a bone handle, a knife-blade, and several axes. There can, then, be no doubt whatever as to the existence of an indigenous metallurgy here; but we have now to note a fact which has an important bearing on the origin of this metallurgy. Whilst copper was thus extensively used and manufactured into implements on the spot, bronze appears to have been known at the same time, although it was not made in the district; it appears solely in the form of ornaments at this period, and these are of a higher type than that of the rude copper industry then prevailing. Thus it is most probable that whilst

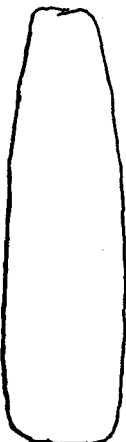
(SOUTH EAST SPAIN)
COPPER IMPLEMENTS, ETC.



Arrow Head
 $\frac{1}{2}$



Knife
 $\frac{1}{2}$



Axe
 $\frac{2}{3}$



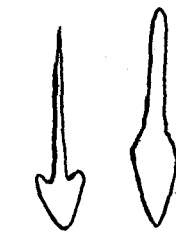
Awl
 $\frac{1}{2}$



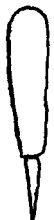
Chisels
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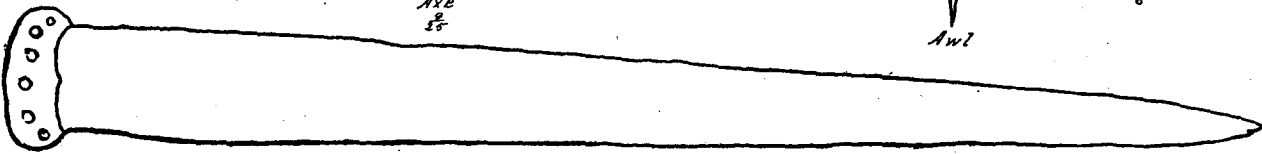
Arrow Heads.
 $\frac{1}{3}$



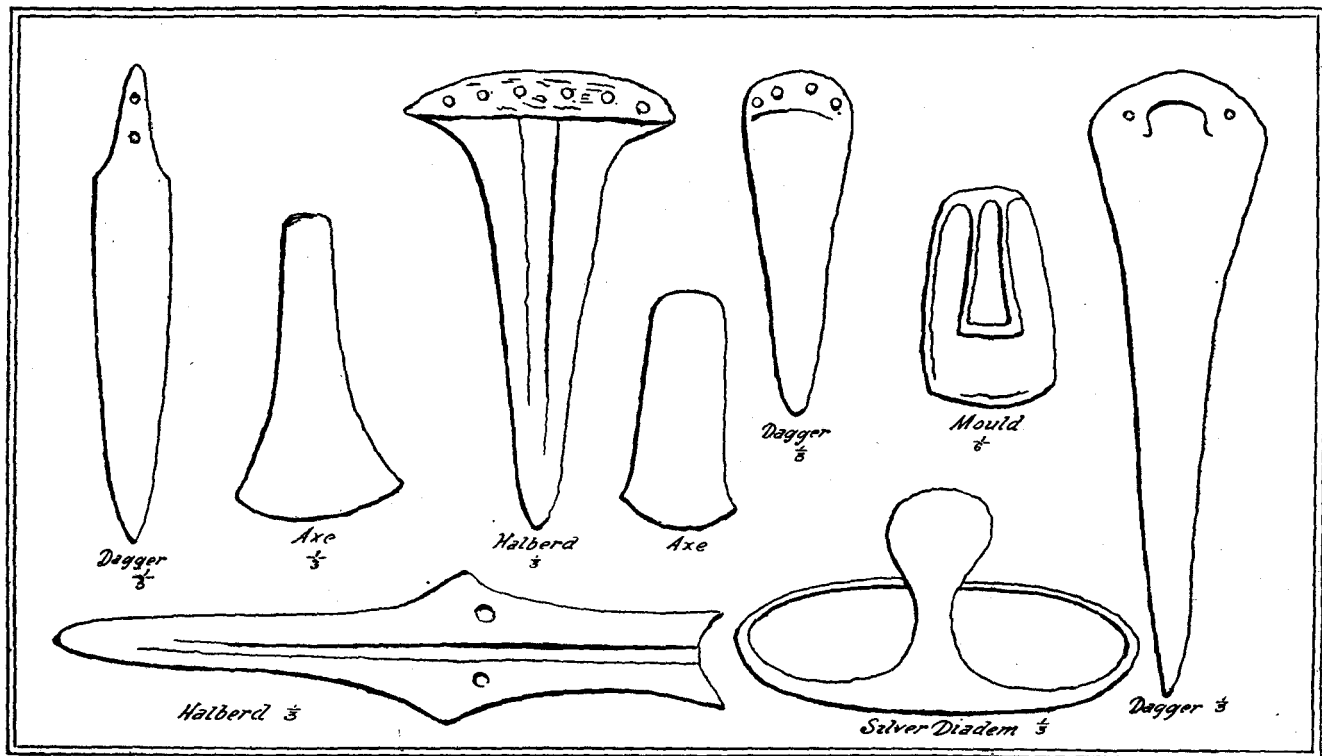
Awl



Crucible
 $\frac{1}{4}$



Sword $\frac{1}{2}$



These figures are taken from MM. Siret's work, "Les premiers Ages du M \acute{e} tal dans le Sud-Est de l'Espagne."—J. M. MELLO.

there was in this part of Spain an indigenous copper metallurgy, visitors from other districts more highly cultured introduced the ornaments, bracelets, beads, and rings, &c., and may possibly have taught the people the use of their copper ores.

Cremation as well as ordinary burial was practised at this time, showing a foreign influence at work amongst the Neolithic peoples; but ordinary burial was in use at the same period, and it has been suggested that the honours of cremation may have been reserved for the men, as no weapons or implements are found in the graves with unburnt skeletons, but only ornaments, which appear to denote that the bodies were those of females. A similar practice, with a probably similar interpretation prevailed, it has been pointed out, in Switzerland; the Moraine of S. Prex contained regularly-interred bodies with bronze ornaments, and alternating with the skeletons were urns filled with a black substance surrounded by cinders.

MM. Siret, in calling attention to the fact that there is no tin in the district which they explored, also point out that certain carnelian beads found in the graves are of foreign origin, and they suggest that the art of metallurgy was probably introduced into the locality by strangers who were acquainted with bronze and its production, but could not impart the art, having no tin; all that they could do would be to instruct this Neolithic people how to smelt their copper ores, and they probably also taught them an improved mode of constructing their houses.

Let us now approach the question as to the original source of the bronze manufacture. We find it in general use in Europe at the close of the Neolithic age, the late Stone and the Metal ages overlapping one another; but as far as we can judge, the first bronze workers did not make the discovery of this material in Europe, but introduced it from some other region of the world, and the workers in bronze were themselves of a different race to those amongst whom they first came. Copper may have been known and used in certain districts where it occurs plentifully even before the coming of this race, as the characteristic properties of the native metal are easily discovered, but, as far as we know, there is as yet no direct evidence that the metal was used before the foreign visitors made their appearance with the more perfected forms of metallurgical art.

What we want to know, in order to solve some of the questions as to the origin of metallurgy in Europe, is whence

the tin was derived which was employed in the bronze manufacture? M. Germain Bapst observes that philology and geography may aid us in replying to this question.* He remarks that it has been said that the Chaldeans and Egyptians, and, at a later period, the Phœnicians or some other maritime people, brought the tin from the Caucasus, but that, unfortunately for this hypothesis, it has been ascertained that this metal is not found in the Caucasus. Mr. V. Baer considers that the neighbourhood of Mesched, in Khorassan, may have produced it. M. Ogorodnikoff has stated that the inhabitants of that place had told him there were mines of tin as well as of copper and iron, &c., near to their city, and that he himself had actually seen many vessels of tin which the owners said had been made of the tin of that locality. But M. Bapst doubts the truthfulness of the Tartars as to this; he says that all the tin they use is imported in bars from England, and considers it beyond question that there are no tin mines near to the Caspian Sea, and that if there were any at Mesched that metal would certainly not be imported from so distant a place as England.

Another hypothesis makes India the source of the tin used in antiquity, and the Hindoo Kush and the Malacca peninsula are said to be localities whence it may have been derived. M. Lenormant is in favour of the Hindoo Kush, as is also M. Bapst. It is a fact that tin is found in that mountainous region which separates the Chinese empire from India and Central Asia, and the valley of Hilmend may have been, at any rate, one of the original sources of that metal, which, in the prehistoric ages and down to a far later period, was distributed far and wide in all directions. According to M. Bapst, philology supports the views thus advocated; he says that Humboldt and Burnouf have observed that the word “*κασσίτερος*” bears a resemblance to Arab, Illyrian, and other words used for tin, all of which find a common root in the Sanscrit “*Kastira*”; but it has lately been shown that Sanscrit may not be such an ancient language as it has hitherto been reckoned, and, according to Mr. Sayce, “*Kastira*” is not the original root: he suggests the word “*Kasduru*,” which is found in the primitive Accadian of Babylonia; it is right, however, to say that M. Oppert and some others dispute this. But there is yet another region,

* “*L'Étain dans l'Antiquité*,” *Revue des Questions Scientifiques*. Brussels, 1888.

almost unexplored, from which some, if not all, the tin of the earliest epoch may have been obtained, and that is the Altai range. M. Pavet de Courteille says that in the Turkish language tin is called *calai*, a word which has no representative in any other ancient language, and he argues that the Turks must, therefore, have been acquainted with tin in the first home of their race, since they did not borrow its name from any other people. Now, according to their traditions, the Turks had the cradle of their race in the neighbourhood of the Altai mountains, a range which is known to be extremely rich in metallic ores. A singular fact is also noted, — viz., that in India the modern word for tin, “Kulu,” seems to have been derived from the Turkish “Calai.” The fact that the early navigators went to the head waters of the Black Sea to get their tin, and which probably led to the idea that it was obtained from the Caucasus, is readily explained by the hypothesis that it was brought from the interior of Asia. In old Chinese documents tin is stated to have been brought from the north-west of China; and Chinese bronzes are known to which at least a date of 2000 B.C. can be assigned.

We are thus brought to the following conclusions that the first tin discovered in antiquity was probably either in the Altai or the Hindoo Kush. But we have now to ask whether it is necessary for us to suppose that the tin used in the European bronze manufacture was brought from such distant regions: may it not have been found nearer home? In order to meet this question, we must see what possible European sources existed whence this metal may have been obtained. It is well known that the Phœnicians were in Spain as early as 1100 B.C., and they may have entered it at a still earlier date, and it is a well-known fact also, that this people derived, at any rate at one period of their history, a large amount of tin from the Cassiterides, or the tin-producing district of Cornwall, which they are said to have discovered. It is certain that in early times this was one of the great sources of tin known to the ancient European peoples. But it is equally clear that this was not the only source: Spain itself has its tin mines, which were worked by the Phœnicians and the Carthaginians, and there are other European localities in which tin was worked at an early date. MM. Mallard and Simonin have discovered traces of tin workings in France in the districts of Limousin and La Marche, also in Brittany, near Ploërmel, as well as near the mouths of the Vilaine and the Loire. Why, then, should not the bronze-workers of ancient Europe have

obtained their tin from such sources as these, rather than from the distant East? That in the course of time they did so is pretty clear, but the invention of bronze,—indeed, of metallurgy in any form,—did not, as far as we can judge, originate in Europe; the first bronze, then, was not of European manufacture, but was a foreign importation, brought in by a foreign race, who, in the course of time, instructed the original inhabitants of this part of the world in the art of smelting the metallic ores, and thus led in due course to the discovery of independent sources of the various metals which they used. All progress in civilisation in this part of the world appears to have travelled from East to West and not in the contrary direction. Thus it is hardly likely that the manufacture of bronze was invented by the Phœnicians simultaneously with the discovery of tin in Spain, and that they should have made there so great a stride at a time when the highly-cultured Egyptians were ignorant of the bronze alloy. Another objection to this view, that bronze was invented in Spain, is the fact that the Murcian graves which have been described contained much more pure copper than bronze, the bronze appearing at first only in the form of ornaments of a far higher type than that of the accompanying copper implements. The tin mines of Spain are all on the western side of that country, and all the evidence we have seems to show that it was not until a comparatively late date that the mines of Spain and the more distant ones of Cornwall were discovered and used.

The conclusion we arrive at is, that the bronze metallurgy originated at a period long anterior to its introduction into Europe, probably in the central region of Asia, in the supposed cradle of the human race itself, and that thence it spread by slow degrees far and wide in every direction, as an accompaniment of advancing civilisation; and that whilst Europe was still in the rudeness of the Stone age, metal-working people far advanced in culture were to be found in the central parts of the Asiatic Continent, who should push their way both East and West and gradually displace or blend with the older populations, bringing with them the arts and appliances of that higher culture which was the dawn of our present civilisation.

We may note in passing that although copper and tin seem to have been the metals which first came into use in pre-historic times, it is probable that at a very early date gold and silver were also utilised in localities where they were found in a native state. It has been commonly supposed that

silver was unknown until the introduction of iron, but MM. Siret have found in some of the Murcian graves belonging to what they call the third or Metal age, a considerable number of both gold and silver ornaments, as rings, beads, brooches, pendants, and diadems, made either of wire or of beaten plates of the precious metal; and some of the bronze swords or daggers belonging to the same age were decorated with silver rivets. In their search for copper the early miners would come across the silver, which was till recently obtained in abundance at Herrerias de Cuevas, in the province where the discoveries alluded to were made, and it does certainly appear from these discoveries in Spain that wherever native silver was sufficiently plentiful to attract attention, as is the case in the district in question, then it would naturally have been made use of. The same thing may be said of the gold which was found in the same district. M. Recaredo de Garay also describes some discoveries of primitive workings for copper in the province of Huelva, and ascribes to the miners of this locality certain tombs which contained not only copper implements, but also ornaments of gold and silver of rude workmanship. Again, in Andalusia, in a cave containing many human skeletons, on the skull of one was found a gold diadem, whilst numerous stone implements as well as objects of bone and of other materials were discovered with them; it is, however, not easy to assign any definite age to these remains, which may belong to a comparatively late date.

There are two other metals which came into use in early times, one of which, iron, soon became of such importance as to give its name to the age in which it replaced the bronze in common use. The other was lead. With regard to lead we have no certain indications as to when, or by whom, this metal was introduced; we may surmise that the first discovery was made accidentally through the reduction of its ore at some surface outcrop. The silver, which, as we have seen, was known at an early period in Spain, was not derived, as was that of a later date, from lead ores, but from veins of the native metal, otherwise we should have found lead simultaneously used; but in the bronze of Spain, as in that of North-Western Europe, there is no admixture of lead unless it be accidental or infinitesimal in quantity. But we now come to a remarkable fact: both the ancient Egyptians, the Greeks, and the Etruscans of Italy used lead in making their bronze, as did also the Romans, but the Swiss bronze, in common with all the bronze of Northern Europe, has none.

This is of importance when we discuss the origin of the bronze industry in this part of the world. The use of bronze in Germany, Switzerland, France, and Spain without any intentional lead alloy, seems to show that the importation was, in the first instance, independent of the Southern influence, and may have travelled directly from the East; any way the Etruscans and Phœnicians could not have been the first introducers, although at a later date the Etruscans, who came into Italy ten or twelve centuries before Christ, and were acquainted, not only with bronze, but with iron also, had undoubtedly a great influence upon the bronze as well as upon other industries of neighbouring countries. There was, we know, a magnificent bronze metallurgy flourishing in Italy during prehistoric times. A race closely connected with, if not identical with, the Etruscans, made use of bronze for weapons and implements as well as for ornaments; they also worked the bronze into urns, some of which have been found enriched with bas reliefs representing both animals and men. That this primitive Italian race should have been able to bring their metal work to so great perfection, may, in part, be attributed to the fact that they had, within their own territory, both copper and tin in abundance. M. Blanchard discovered that the tin mines of Cento Camerelle in Monte Valerio, in Tuscany, were worked by the Etruscans, whilst the copper mines of Montieri (Mons *Æris*) are not far away. The somewhat later Etruscan art was similar to theirs, and their influence extended far beyond the confines of Italy, whilst they themselves were evidently much affected by early Greek as well as by Egyptian civilisation.

The earliest records of the Mediterranean peoples bring before us a highly civilised Egypt, an Egypt possessed not only of bronze, but also of iron, whilst the Egyptians at the same time made use of flint for various purposes, such as engraving their granite monuments. It has been noted that in Southern Italy bronze daggers identical with the Egyptian have been found, and remains of a similar type to the Egyptian have been discovered at Hissarlik. The Phœnician work was probably only a copy of the Etruscan. The same Palæo-Etruscan art appears also at Mycenæ, and it seems on the whole evident that the bronze metallurgy which displaced the Neolithic civilisation cannot be traced beyond Egypt, and we can only assume that it came originally from the East.

The Etruscans were acquainted, as were the Egyptians, with iron; and the admixture of iron with bronze objects which was found in the great transition cemetery of Hallstadt has

been assigned to this people, who were the great masters of metallurgy during the height of their power. As to the first introduction of iron into Europe, we are much in the dark. Before the coming of the Romans we know that it had taken the place of bronze for weapons in most countries; and just as we found the Neolithic Stone age and the Bronze age overlapping each other, so do we find an overlapping of the Bronze and Iron ages, not only at Hallstadt, but in Switzerland, and in France and in other places a period of transition is clearly denoted by the character of the remains found. The lake cities of Switzerland appear to have been attacked, and destroyed in some instances, by strangers possessed of iron weapons. Besides this a period of transition is denoted, both there and in other places, by the discovery of iron implements, the design of which was copied from those of bronze, just as in the earlier period we found bronze copies of those of stone. Iron first appears in Europe as a luxury, as a more precious metal than bronze; thus we find iron blades with bronze handles.

Early tradition tells of fires on Mount Ida, either the Phrygian or the Cretan Ida, which melted the iron ores, and so led to the discovery and use of this metal in Europe; but at a far earlier date iron was known in Asia.

Three stages have been made out by M. Chantre, in the history of European metallurgy, which have been named the Cevennian, the Rhodanian, and the Mceringian.

I. The Cevennian marks the transition from stone to bronze, bronze appearing mostly in the form of ornaments.

II. The Rhodanian is that in which bronze was in common use, although stone was still employed for various purposes.

III. The Mceringian is the transition period from bronze to iron. The cemetery of Hallstadt belongs to this age, as does also what is known as the treasure of Reallon, a find of all sorts of objects,—knives, sickles, bracelets, rings, &c.,—which appear to have been a merchant's stock-in-trade, lost on the road from Etruria, the general type being, as that of Hallstadt, decidedly Etruscan.

In conclusion, let us see whether it is possible to ascertain who were the real originators of metallurgy in Europe.

It is pretty generally allowed that, during the Neolithic age, the inhabitants of Europe, at any rate of its western portion, were of non-Aryan stock. An examination of their remains show that they were a small, long-headed race, who were in the habit of burying their dead in caves and chambered tombs. Great Britain and Ireland, France and Spain,

have yielded very numerous skeletons of this age, all of them clearly belonging to one and the same race, a race which has been identified by anthropologists with the modern Basques and the small, dark men of Aquitaine, who, together with others of a similar type, may be regarded as the survivors of this once widely-distributed pre-historic people, who occupied, not Europe only, but were also found in Asia Minor, in Sicily, in Sardinia, and in Northern Africa.

During the Neolithic age the principal implements and weapons were made of stone, often polished after having been carefully chipped into shape; others of bone, and antlers of deer were also used. It was amongst these Neolithic peoples that the use of metals was introduced; but by whom? The question is not easily answered. That the manufacture of bronze and the smelting of metals was not the independent discovery of the Neolithic inhabitants of Europe, but was introduced from without, and by a different race, is evident from many facts. One important one that has been pointed out is that over the whole of the Continent, wherever bronze implements have been found, they are everywhere nearly identical in form, although "each country has certain minor peculiarities."

Sir John Lubbock, in his work on "Prehistoric Times," observes that the bronze swords found in Scandinavia must have been introduced by a smaller race than those now inhabiting Europe, as the hilts of those weapons could not be grasped by hands as large as ours. He also says that Nilsson considers that the ornamentation of the age, as shown on Scandinavian finds, is Semitic rather than Aryan, and his opinion seems to be that the Phœnicians introduced the bronze into the North of Europe: this, however, has been questioned, on the ground that when the Phœnicians appeared in Europe they must have been acquainted with iron, and had they been the introducers of bronze they would, at the same time, have introduced iron and probably also lead. As to the smallness of the hands, Sir John Lubbock remarks that "the Indo-European (Aryan) Hindoos share this peculiarity with Egyptians, and this characteristic is, therefore, equally reconcilable with an Indo-European origin of the bronze civilisation as with a Phœnician." It is to be noted that the use of bronze did not prevail in Scandinavia until a comparatively late part of the Bronze age; the Stone age was prolonged there, and when bronze appeared the various objects made of that material were of a very high type; we do not meet there with the primitive forms characteristic of the earlier metal age,

whilst the use of bronze continued in Denmark as late as the third century before our era, or even the second, according to Sir A. Franks.

We have already observed that the art of metallurgy seems to have originated amongst a race which was neither Semitic nor Aryan. At a period when the Aryans and Semites were pastoral nomads, the Accadian population of Chaldea were well acquainted with metals; and it is stated that it is always in branches of the so-called Turanian and Altaic families of mankind that the use of metals is found as an *original* possession, that these races link their own origin with metallurgy and give this art a preponderating place in their mythologies,—a thing which is unknown amongst those of other races. If this be so, then we must conclude that both the Semites and the Aryans, and, according to some authorities, also the Hamites, learnt the art of metallurgy before their migrations, and carried with them a knowledge of the smelting and working of metals into the various countries where they settled. It is said, however, that philology proves that the Aryans were unacquainted with the use of iron until after their dispersion. The able Belgian reviewer, who writes under the *nom de plume* of Jean d'Estienne, says that the Hamitic tribes who entered Egypt before the dawn of history, and mingled there with the aboriginal race, brought with them the use of metals, metallurgy there appearing plainly to have been introduced from the North-East. Whether the aboriginal tribes had any implements other than those of stone we do not know; but it is considered fairly proved that the first Egyptian dynasty resulted from the fusion of the Hamitic and negro races, and that it was the Hamitic race which introduced metallurgy into the valley of the Nile. Then, again, the Semitic peoples attribute the invention of metals to a period so remote as to go back, as we have seen, to the very origin of mankind; and there is, it is said, nothing in tradition, or in their language or customs, to denote a time when they were ignorant of the use of metals, the invention of which they ascribe to a descendant of Cain. Philology is also said to prove that metallurgy existed in an advanced state amongst the Aryans before the separation took place between the Eastern and Western branches. In India, we are also told that, before the Aryan immigration took place, both bronze and iron were in use, and a remarkable fact is dwelt upon, viz., that the average proportions of copper and tin used in the bronze were identical with those found in the bronze of all pre-historic antiquity. This cannot have

been due to accident, but clearly points to a common origin of the manufacture; but we are still in the dark as to the actual race which introduced metallurgy into Europe, and whether those non-Aryan peoples who seem to have been the occupiers of the soil at the time of its introduction, and who themselves came from an Eastern home, left the cradle of their race before the discovery of metallurgy; either they must have done so, or else must have fallen back into barbarism. As to when their first migrations took place we are utterly in the dark; at the time when we first meet with them other races, such as the Celts, were already pressing upon them. In Gaul, and also in Spain during the Neolithic age remains of a taller race than the small Iberian were mingled with these latter. We do not know whether the men who brought in the use of metals,—those men, for instance, who entered Spain in the South, or Scandinavia in the North,—were Semites, Aryans, or neither the one nor the other. Nor is it easy to understand the exact route taken by the introducers of metallurgy, nor whether they all belonged to the same race, as Sir John Lubbock has noted a curious fact: bronze swords, he says, which have been found in such large numbers in the North of Europe, have been very rarely met with in Italy; and then there is that other circumstance previously mentioned, viz., the use of lead in their bronze alloy by the Etruscans and Egyptians.

Turning once more to Spain. MM. Siret call attention to the fact that the men who introduced the art of metal-working also brought with them, as we have seen, the practice of cremation and urn burial, and, quoting from Rougemont, say that “the urn appears to have been unknown to the Egyptians and the Semites.” The cinerary urn “is altogether Aryan, Indo-European, Japhetic”; and Dr. S. Müller tells us that the Phœnicians did not burn their dead, but buried them in coffins. Cremation and urn-burial, he adds, is one of the features of the ancient Greek civilisation; he also says that the ornamentation of the pottery, &c., by the use of straight lines can be followed from Italy through Europe, as far as Scandinavia, in the series of remains, more recent than those in which spiral and curved line ornamentation prevails; and with the adoption of this straight line ornamentation, carried from Greece to the North, came in the new funereal usages, viz., the burning of the dead and the storing of their ashes in urns in common cemeteries and in tumuli. At a very early period there appear to have been commercial relations between the people who inhabited Greece, Italy, and Spain, and

MM. Siret think that the period they have named "Transition" was anterior to that when the first navigators made their expeditions to Spain, and that probably the discovery and use of silver in that country was one of the great attractions which drew these voyagers to its shores. The actual race which introduced metallurgy into Spain during the Transition epoch does not appear to have been permanently established there, although probably some admixture with the Neolithic inhabitants took place; but in the immediately succeeding age, when metallurgy was fully practised and when bronze and silver were in common use, the strangers who taught the new art seem to have disappeared for a time, as cremation was no longer practised and the old Neolithic custom of burial was resumed. The character of the ornaments also underwent a change, whilst, at the same time, metallurgy, domestic architecture, and the pottery taught by the visitors or invaders were retained and even improved upon; and the general advance in culture was great. All that we can therefore conclude as far as we have got, is that the race which taught the Neolithic Spaniards metallurgy was probably Aryan; and that the same race imparted the art to the other peoples of Europe where a similar bronze industry existed. As to when this was we have no means of knowing; we know that not in Europe only, but also in Asia Minor, there was a Neolithic age, which was gradually replaced by one in which bronze was the prevailing material, from which both implements and ornaments were manufactured; and this substitution took place by degrees all over Europe. The valley of the Rhone is rich in remains of the Bronze age, no fewer than thirty-nine foundries having been found; the French museums, as well as those of other countries, are full of specimens of the art, showing the spread of the new civilisation. All the evidence shows that the metallurgy of the Bronze age travelled from an easterly and probably southerly direction, and during the later part of the Bronze age Etruria was one great centre, whence it spread to Northern Europe. There is much to show that the change at first began in a peaceful way through the ordinary channels of commerce: amongst the earliest objects found are personal ornaments, whilst implements and warlike weapons seem to have been introduced at a later date; then, as time went on, the high art of the Etruscans gradually influenced the neighbouring countries, and travelled northward as far as Scandinavia and the British Isles. In the wake of the merchants would come in due course the actual makers of the bronze in various

places, and thus such foundries as those in the Rhone Valley, in Germany, and in Great Britain would be established for the repair of broken objects or the casting of new ones.

As to the actual origin of metallurgy we can, as has been seen, only obtain faint indications, which are almost lost in the obscurity of ages still more remote than those in which the Neolithic men of Europe learned to beat the copper into shape and to smelt its ores, and mould the alloyed copper and tin into those varied and graceful forms which characterise the Bronze age of human civilisation.

The PRESIDENT (Sir G. Stokes, Bart., M.P., P.R.S.).—I am sure all present will join in thanking Mr. Mello for his most interesting paper. I now invite discussion upon it.

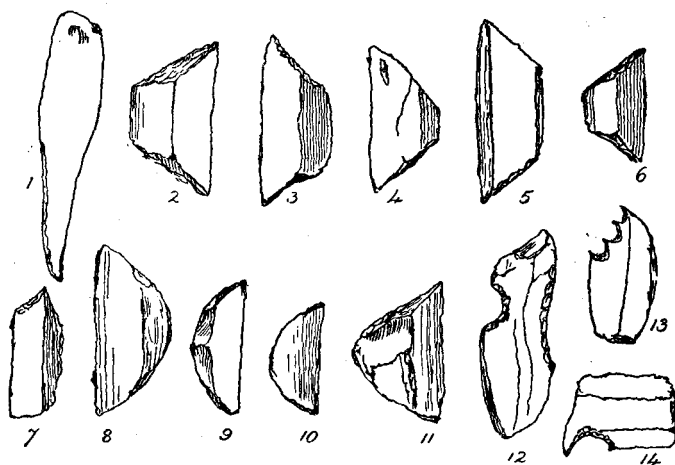
Major T. A. FREEMAN.—May I ask Mr. Mello whether I am to understand, by what he says at the bottom of page 287—“both the ancient Egyptians, the Greeks, and the Etruscans of Italy used lead in making their bronze, as did also the Romans,”—that they used both lead and tin; or that the tin was supplanted by the lead?

The AUTHOR.—As far as I know, tin was used as well as lead. The two metals were used together, to the best of my belief. I am not perfectly certain about it, but believe so.

Mr. J. ALLEN BROWN (F.G.S., F.R.G.S., &c.).—Mr. President: When the Institute was good enough to send me a proof copy of this excellent paper, with the suggestion that I should append to it any notes relating to the subject, I found that it gave me an opportunity of throwing, possibly, a little light upon the origin of the earliest people who wrought in copper. I will endeavour to explain what I mean.—It is worthy of notice, as showing the Eastern origin of the early workers in copper and bronze, that, associated with the metal objects discovered by MM. H. and L. Siret in the pre-historic stations between Carthage and Almeria, and figured and described by them in their elaborate work, *Les premiers Ages du Métal dans le Sud-Est de l'Espagne*,* are, in addition to polished celts, &c., some diminutive stone implements

* “Anvers, 1887. Ouvrage Couronné au Concours MARTORELL de Barcelona (Prix 20,000 francs), et ayant obtenu une médaille d'or à l'Exposition Universelle de Toulouse de 1887.”—Copy in British Museum (press mark 1703 A 21 & 1703 c 9).—ED.

of unusual and very distinctive types; they are of crescent, quadrilateral, triangular, and other forms, drawings of some of which are here figured.



SMALL FLINT IMPLEMENTS (*actual size*).

(From MM. Siret's work.)

- FIG. 1.—VERY FINELY-WORKED SPIKELET FLAKE.
 „ 2, 3, 4, 5, 6.—QUADRILATERAL FORMS WHICH MM. SIRET SUGGEST MAY BE
 ARROW POINTS.
 „ 7.—INSTRUMENT WORKED TO A FINE POINT.
 „ 8, 9, 10.—CRESCENT-SHAPED IMPLEMENTS.
 „ 11.—TRIANGULAR-SHAPED IMPLEMENTS.
 „ 12.—INSTRUMENT WITH CHIPPED DEPRESSION, OR SMALL SPOKESHAVE.
 „ 13, 14.—FINELY-POINTED INSTRUMENTS WITH CHIPPED DEPRESSIONS.

I have referred to these peculiar types of implements in a paper, read at the Anthropological Institute last year,* in which I showed that it appears probable these diminutive implements indicate the occurrence of a particular industry, or custom of some kind, for which they were made towards the close of the Neolithic age. It will be noticed that these diminutive

* "On some highly specialised Forms of Stone Implements found in Asia, North Africa, and Europe." *Jour. Anthropol. Inst.*, Nov. 1888. MM. Siret's work did not come before me until after I had written it.—*J. A. Brown.*

implements of crescent, trapezoidal, triangular, spikelet, and other forms are all trimmed into shape by very neat secondary chipping, and are not simply flakes unworked, which may be of any form when detached from the core or nucleus. Now it is very remarkable that small implements of these peculiar types have been found in certain places,—in Central India, Syria, the Crimea, and along the shores of the Mediterranean, Portugal, in France, and also, I believe, they may be traced into Britain. Thus they have been discovered in caves and rock shelters of the Vindhya Hills (in large quantities), in Baghelkand and Bundelkand associated with pictographs on the walls and pieces of hematite, in Banda, Rewa, &c., and in Syria (near Bethlehem),* abundantly near Kizilkoba (Crimea),† in Egypt, Tunis, and, I believe, in other places in North Africa. In Italy, Portugal (in Kjockkenmoeddings), also in France, as at Hedouville and Coincy L'Abbaye.‡ Those from India were originally discovered by Mr. A. C. Carlyle, late Archæologist to the Indian Government, who presented examples of all the forms to me. Very small cores and flakes of obsidian have been found on the Isle of Melos and other islands in the Greek Archipelago, indicating the same industry. It is curious that those from the rock shelters of the Vindhya Hills were often found associated with ground hematite and pieces of the same substance evidently used as a pigment, perhaps for tattooing, and that the walls were decorated with pictographs, possibly early endeavours to form written language. Since my paper directing attention to the subject was written, a carefully-trimmed, crescent-like implement has been shown to me from the Surrey hills, and I believe Canon Greenwell has one of the scalene triangular form, from Yorkshire or Lancashire. With regard to the two latter, of course it would not be safe to trust to the discovery of two specimens, though I have little doubt that others will be found. In most of the other places,—in India, the Crimea, Africa, &c.,—they have been found abundantly. I have a large number of these highly-specialised forms in my collection. As I have

* "Collections from the Holy Land," &c., Captain Burton. *Jour. Anthropol. Inst.*, vol. i.

† *Premières Recherches sur l'Age de Pierre en Crimée en Russe*. M. Merejkowski, St. Petersburg.

‡ *L'Homme*, M. G. de Mortillet, Directeur, for August and November 1885, &c.; also for 1884, p. 145.

pointed out, these very interesting, diminutive instruments appear to be characteristic of a particular race or people, whose migration may be traced by the various sites at which they have been found; and by the light of MM. Siret's remarkable discoveries in Spain, it would appear as if the fabricators may be identified with the earliest workers in copper in Southern and Western Europe, a race which, emanating, possibly, from Central Asia, penetrated into India, and also migrated and spread out through Syria to the Crimea and along the fertile regions of the Mediterranean to Spain, Portugal, France, and probably even into England. At any rate, they afford a clue to the home of the early metal-workers which may hereafter be followed up, as these forms are so distinctive in character as to afford almost as good evidence as the occurrence of a particular kind of pottery or other object: hence I have thought them of sufficient importance in relation to the discoveries in S.E. Spain to which the author alludes in his excellent paper, to make these remarks before the Institute, and as they may probably afford him and others a line of investigation which may be useful. It would be remarkable, as confirming the hypothesis I have suggested, if the carnelian beads found by MM. Siret should be proved to be made from the Indian variety, which is harder and in some other respects differs from the ordinary red carnelian. MM. de Lisle have also discovered diminutive implements of precisely the same forms, crescent, trapezoidal, triangular, and finely-worked spikelet or lancelet, instruments, at Begrol and Cléons (Loire Inférieure), drawings of which have been kindly furnished to me by Mr. Charles Seidler, late of Nantes, under whose fostering care and enterprise the very interesting and important collection of prehistoric and anthropological objects now possessed by that city was accumulated. MM. Siret's discovery of stone implements of late Neolithic age associated with objects of copper and bronze showing that metal was then coming into use, is an important one, and goes beyond the well-known fact that stone was employed in arrow-heads, &c., long after the introduction of bronze and even iron in localities where less civilisation existed. The hypothesis of the Eastern origin of the earliest metal workers in Europe is supported through other lines of investigation. The disposal of the dead by cremation, and the employment of cinerary urns, to which Mr. Magens Mello has alluded, appears to have been a custom characteristic of the bronze-using race, which is confirmed by the discoveries of MM. Siret, a practice which was not in vogue with the earlier Neolithic people, who interred their dead often in a

sitting posture in the long-chambered barrows. Much can be said tending to show that the practice in use in the Bronze period was of distant Eastern origin. Again, Dr. E. B. Tylor and others have shown that rude stone monuments (Dolmens as well as Cromlechs, and stone circles) may be traced in a remarkable line from India, through Syria to North Africa, and up the west side of Europe; such monuments are considered by many archæologists to be of the Bronze age, like the round or bowl-shaped barrows. If we regard the early metal workers in Europe as an Aryan stock, philology becomes an important help to prehistoric archæology. From the roots of words in the Indo-European languages we are able to obtain some conception of their mode of life, &c., while the most ancient literature of Aryan origin and cult embodies solar myths and fire worship, which there can be no doubt formed the essential elements of their religion; a sun or fire worship which under various forms entered so fully into the faith of the Kelt, Greek, Latin, &c. M. Chantre has confirmed these views as to the religion of these ancient metal workers, by his investigations into the ornamentation employed during the Bronze age, for pottery and other objects. In it may be traced several symbols of sun or fire worship, such as concentric circles, and above all the "Swastika," an essential portion of the fire drill. Professor Sayce has lately alluded to the existence in Syria of an aboriginal white race, which it is suggested may be of Aryan origin, and which he believes to be a remnant of the Amorites of the Scriptures. He also points out that a similar white race exists in isolated groups in North Africa, *i.e.*, the Kabyles, the Libyans of antiquity, whose white faces, &c., it is said, may be noticed in the wall pictures of ancient Egypt, and can be distinguished from those of reddish hue representing the Egyptians themselves, and others. There is another point which I wish to notice briefly, and that is in reference to the early use of tin as an alloy in making bronze. Besides those described by MM. Siret, objects of pure copper have been found in some of the Dolmens of Aveyron, and in certain caves and other places believed to be of late Neolithic age, but such objects are rare, and judging by the very few which have been found, it would seem that pure copper was very soon superseded by bronze. The proportion of tin employed as an alloy, although generally stated as one-tenth to nine parts of copper, really varies from rather under 10 to 14 or even 15 per cent. It would be interesting to know whether the earliest bronze articles contain a greater or less

proportion of that metal. With regard to the puzzling question as to how metals were first discovered and how it arose that the alloy of tin became afterwards so soon known, it has been suggested to me that in the stream tin deposits of Cornwall, &c., which were worked by the Phœnicians, and probably at an earlier date, rounded fragments of copper as well as tin are found in them. If it happened that such pebbles of stone and metal were heated for use as pot-boilers, *i.e.*, thrown into holes in the ground, &c., for cooking purposes, it may very well have been noticed in the late Neolithic period that they both melted; the discovery of the bronze alloy may then have quickly followed that of copper.

Rev. F. A. WALKER, D.D., F.L.S.—In the highly interesting paper which we have had the privilege of listening to, a great deal has been said about Spain, and I think more about Spain than any other country in Europe, and also about smelting in Spain, and the links between Spain, Italy, and Greece, connected with metallurgy. It is rather a remarkable fact that in the present day, as regards the lead mines at Laurium, in the southernmost part of Attica, eleven out of the fifteen shafts now worked existed in ancient times; although I am not prepared to say, one way or the other, whether there are any signs of prehistoric metallurgy there still. Looking back through the centuries, we read how that when a proposal was made in the Athenian Assembly to divide the rich proceeds of the mines at Laurium among the populace at the rate of a *mina* per head, Themistocles diverted his countrymen from their purpose, and by his urgent representations persuaded them to devote the money instead to building the fleet which subsequently stood them in good stead against the Persians at Salamis. We know too that a generation later Alcibiades had lead, and probably also silver, mines there. We are likewise aware that metal at Laurium now, instead of being smelted on the spot, is sent to the south of Spain; and it is the more remarkable when we consider how the people of many European nations are engaged there, either as day labourers or as possessing an interest in the proceeds of its mines. For example, the Scotch people and the Germans, two races closely corresponding as regards industry and frugality, who, one would think, would have every means of smelting it on the spot, at this late age, send the metal to Spain, as we have just been told they did in former time. The aspect of Laurium, with its vegetation of stone pines and undergrowth of *cistus*, &c., withered and blackened by the smoke, and its rows of dwellings for miners of different

nationalities, more closely resembles some Cornish mining village, as Redruth or Camborne, than an ordinary Greek country hamlet. I think it is a wonderful thing how custom lasts, that at this time they should take the trouble to send the ore to the Spanish coast to be brought into use.

Mr. DAVID HOWARD, F.C.S.—There is one point that I think it will be well to consider in treating this very important question, and that is the very high pitch of civilisation which the use of metal means. It is to us so natural that we do not very often consider the intelligence that must be required to introduce metal at all. No doubt the origin of the discovery of metal was by some chance; but given that chance discovery of metal, perhaps on the fire-hearth, the intelligent observation, skill, and thought required to work and combine these metals is something wonderful. It is not one of those industries which grew naturally, and it is not surprising that the ancients thought it required some Hephæstos to teach the working of metals. The precise reason why bronze differs so from copper and tin is, I believe, at present a mystery: we do not know exactly why bronze is so much harder than the two metals singly, or why the admixture of lead or tin with gold renders gold so brittle that you can powder it; but the fact remains so, and countless ages ago they had found it out, and executed work which seems hardly possible to us now; in fact, we do not know how bronze was brought to the perfection of hardness of those days;* and when we consider the difficulties of working steel and iron without blasting furnaces in those days, it is evident that an amount of skill and thought which it is very difficult to estimate was shown by those men,—those unknown forefathers of metal work who first thought of it and worked with such perfection.

Mr. E. CHARLESWORTH, F.G.S.—In looking over the paper, there is only one thing on which I would venture to make a suggestion. Mr. Mello says:—"The discovery and use of tin in the manufacture of bronze mark, it is well said, a great epoch in the history of human culture, for this metal is never found in a native condition. Its ore is dull and non-metallic in appearance, having nothing about it to attract attention, whilst it is by no means widely distributed." Now it is perfectly true that mineralogists, and

* It has been considered that meteoric iron must have been the first man began to use.

metallurgists too, have no knowledge of tin in a native state; but I would suggest to the author of the paper that that is simply a matter of negative evidence, and in connexion with natural science, there is no more dangerous principle to go on than to trust to negative evidence. Although mineralogists and metallurgists are not, in the present day, acquainted with tin in a native state, those who organised the metallurgy of bronze may possibly have known of its existence in that state. I do not put this forward for a moment as a conclusion that is to be accepted, but merely as a possibility. Then, with regard to the fact that the ores of tin do not present any metallic appearance, that is perfectly true; but there is one thing about these ores of tin which, I think, ought not to be lost sight of by the author of the paper, and that is their great weight. A very prolific source of the metal tin is what is termed *stream tin*. I have been in Mexico, and have here, on the table, to-night, specimens of stream tin ore from Durango, in Mexico, and also from Cornwall; and if any one will take one of these tin pebbles,—for such they may really be called,—I think he will be astonished to feel the extraordinary weight; in fact, they feel as though they were really of the same specific gravity as gold. Now, if we suppose that a people acquainted with the properties of copper fell in with one of these pebbles, they would at once, I think, infer from their great weight that there must be metal of some kind in these pebbles; therefore, the next step would be to experiment with the pebbles and endeavour to get the metal, whatever it was, from the pebble and the ore with which it is combined, which is the ordinary combination of oxygen with the metal. That is the idea here that occurs to me, and perhaps it is a matter which the author may say a word about in his reply. May I, in conclusion, express my special obligation to him for his interesting and instructive paper?

The AUTHOR.—In regard to what has just been said and the first question that was asked, it may be interesting to mention what is to be found in Evans's work on *Ancient Bronze Implements of Great Britain* with regard to the use of lead. It seems to imply that in Egypt lead was used sometimes in the place of tin. There is one sentence here which bears on it:—"The argument, however, that the Phœnician bronze would have been lead bronze, because the Phœnicians derived their civilisation and arts from Egypt and had continual intercourse with that country, where lead bronze was early known, appears to me wanting in cogency. The copper dagger analysed by

Vanquelin gave copper 85, tin 14, and iron 1 per cent. and showed no trace of lead." That would be the tin bronze, I presume. There are one or two analyses that I might read as to the presence of lead and tin together :—

	Copper.	Tin.	Lead.
" Flat celt, Ireland	86.98	12.57	—
" Flanged celt	90.18	9.82	—
" Palstrave (mean)	89.33	9.20	—
" Palstrave, Fife	81.19	18.31	0.75
" A bronze trumpet found at Dowris	79.34	10.87	9.11"

Here it would appear that the lead could hardly be introduced accidentally in that quantity.

" A caldron from Scotland 92.89 5.15 1.78"

These seem most important analyses. Then in respect of Mr. Charlesworth's remarks, I think they are of extreme value with regard to the suggestion of the first discovery of tin as utilisable ore, for the extreme weight of tin ore must, I should say, attract attention at once. Any one picking up a pebble from the stream would say, I should think, "Here is an extraordinary pebble," and would contrast the weight with the ordinary ones, and it would probably suggest to him that there was something metallic in it, as Mr. Charlesworth said; knowing, from his experience of copper and other metal ores, that metals are, as a rule, heavier than ordinary stone. Apart from that, it seems difficult to understand what could have led originally to the use of tin in conjunction with copper. The whole thing suggests a great deal of experiment and intelligence on the part of the first discoverers, and a very long line of experiments must have been carried out before the most suitable methods of working were hit upon. With regard to perforated bronze axes, I am aware that some copper axes, perforated, have been found in Hungary. I think I ought to express my obligation, if you will allow me, to Mr. Brown for so kindly coming here this evening, and I am extremely obliged to him for the most interesting remarks, and also for those specimens which he has brought before us, for I think, with him, that these discoveries of flints (and most remarkable flints they are), and the fact that they can be traced from India into Europe, does show a possible connexion between the makers of these Indian objects and of those we find in Europe, and possibly, as some one has suggested, the early manufacturers of bronze may have been Indian tinkers,—a gipsy sort of people who travelled with their art and

carried it from East to West; and possibly these implements, which no one seems to know exactly what they were used for, would be implements used by these men from India, whoever they may have been, whether tinkers or men of a more highly skilled nature; but it would be extremely interesting if we could discover their use. Some have suggested they were used for tattooing.

Mr. J. ALLEN BROWN.—I find no tattooing in India at present, even among the Hill tribes; but it does not follow that it might not be so.

The PRESIDENT.—Our thanks have already been accorded to Mr. Mello, but I think we should also offer them to Mr. Allen Brown and Mr. Charlesworth, and, indeed, to all the speakers, for their important contributions to the discussion on Mr. Mello's elaborate and interesting paper (cheers).

The meeting was then adjourned.

REMARKS ON THE FOREGOING PAPER.

PROFESSOR A. H. SAYCE, LL.D., has written as follows:—

“So far as the Accadians are concerned, we only know that they were the earlier inhabitants of Babylonia before the arrival of the Semites; that Sargon of Accad, the founder of the first Semitic Empire there, lived B.C. 3800. It is probable that the Accadians belonged to the Mongolian race, but only probable. Direct evidence is still wanting. Their language was agglutinative, and seemed to represent an early form of Turko-Tartar speech.”

MAJOR C. R. CONDER, R.E., writes:—

“I think the conclusions that metallurgy and knowledge of bronze existed first among the Turanians of Central Asia, who were settled when the Aryans and Semites were nomads, will be generally admitted. The use of tin and other metals can, among them, be traced to an earlier date than any mentioned in this paper. Akkadian is thought to have become obsolete by 1500 B.C., yet we have in Akkadian texts notice of tin, *anna*; copper, *urud*; lead, *abar*; gold, *guskin*; silver, *azag*; iron (*anbar* ?); and bronze, *zabar*. One hymn specially speaks of bronze as a mixture of copper and tin, and as this text is bilingual, no doubt exists as to the meaning.

“The Akkadian word *anna*, for ‘tin,’ appears still to survive in the Hungarian language as *ón*, and in Armenian as *anak*. The

Mongol words for tin are quite different, and in Chinese it is *sek*. The Hungarian often retains Akkadian words in recognisable form. I venture to doubt if the Phœnicians reached Spain before the foundation of Carthage in 900—800 B.C. Phœnicians bearing bronze vases are, however, represented on an Egyptian monument as early as 1600 B.C.

“The knowledge of lead, as above mentioned, seems to be of great antiquity among Akkadians. It may very probably be from Turanians that the Phœnician arts were derived, but hardly from Etruscans, who only reached Italy about 800 B.C. It was rather from the Turanians of Northern Syria,—such as the Hittites,—who dwelt in and near Phœnicia, and whose deities (Istar, Tammuz, Nergal, &c.) the Phœnicians worshipped.

“There were, no doubt, long-headed tribes in Europe before the Aryans; but it should not be forgotten that round-headed races also existed there. The Etruscans are very generally regarded as a Turanian, or round-headed race, and the Basque language is recognised as of Turanian origin, both grammar and vocabulary showing an affiliation to the Akkadian. Nor was cremation quite peculiar to Aryans; many Turanian tribes had this custom.

“Tin appears to exist in the Lebanon. I have seen samples, but no important mines are known. It may, however, have been exhausted at an early historic period. It would seem that the discovery of tin was later than the separation of the Turkic, Mongol, and Ugric stocks, since the word is not the same in these various groups of Turanian speech. The Assyrians adopted the Akkadian word (*anaki*); the Hebrews used one quite distinct, viz., אֲנָכִי (Num. xxxi. 22; Ezek. xxii. 18). The early Aryans, who knew gold and silver and a third metal (either copper or iron), did not apparently know tin. This evidence seems to restrict somewhat the anterior date of the knowledge of tin among early peoples, though bronze cannot be supposed to have been first known later than 2000 B.C. at least. In the early Buriat-Mongol dialects tin is called *sagan-tuluguiñ*, or *cagan-tulga*, or simply *tuluguiñ*. Finally, I venture to doubt if safe evidence of Chinese bronze as early as 2000 B.C. has been found, for Sinologists do not admit that the civilisation of China can be traced with any certainty to so early a date.”
