

I.

ON TREPPANNING THE HUMAN SKULL IN PREHISTORIC TIMES. BY
ROBERT MUNRO, M.A., M.D., SECRETARY. (PLATE I.)

A few years ago the Most Hon. the Marquess of Bute, K.T., presented to our National Museum some portions of the osseous remains of a human body which, Dr Anderson informs me, were taken out of a grave near Mountstuart House on the island of Bute. Along with these bones were also found an urn (fig. 1), a jet necklace (fig. 2), and a small bit of thin bronze of an indeterminate character. I regret to be unable to give more precise information as to the position, contents, and surroundings of this grave, because, as the sequel will show, the find is one of more than usual interest. But meagre as the details are, they are sufficient to justify the opinion that the interment took place in the early Bronze Age.



Fig. 1. Urn from Cist at Mountstuart,
Bute, $\frac{1}{4}$.

These bones are now exhibited, and in regard to their general character

I am fortunate in having secured the following note from such a competent authority as Dr Beddoe, to whom I submitted them for examination.

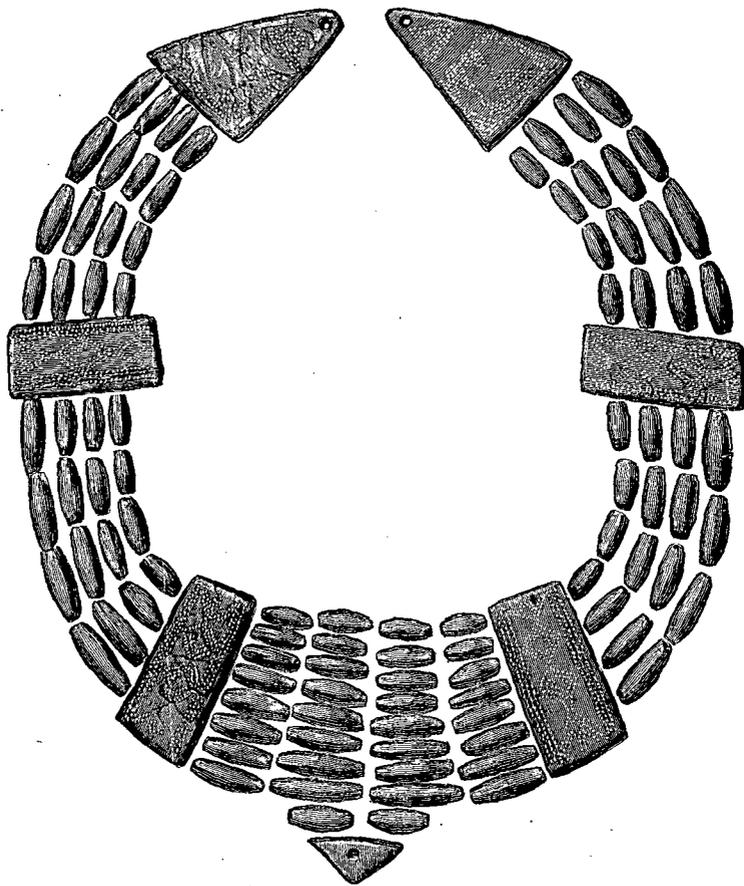


Fig. 2. Necklace of Jet Beads and Plates from Cist (with Urn, fig. 1) at Mount-stuart, Bute.

DEAR DR MUNRO,—The bones you submit to me do not enable me to say much. They consist of a frontal, the greater portion of a left

parietal, part of the right temporal, an imperfect mandible, part of the upper maxilla, right side, and some fragments of long bones. I think the owner was a young woman. The wisdom teeth have not appeared, but the other teeth are already slightly worn by the use of hard food. The mandible is rather small. The skull, indeed, must have been a small one altogether, but this cannot be attributed to mere youth, as the owner must have arrived at the age when the skull is pretty well grown. Frontal minimum diameter 98 millimetres; this is pretty good. Stephanic diameter (about) 115, which is small. Whether the skull was brachy- or dolicho-cephalic I cannot say, but I incline to think the former. There is a small degree of alveolar prognathism, which is more usual (in Britain) with the former.

“Yours very truly,

“JOHN BEDDOE.”

But the special point to which I wish to direct attention is a cup-shaped hollow, situated on the left side of the frontal bone (as shown in fig. 3), and having in its centre a small perforation. It lies

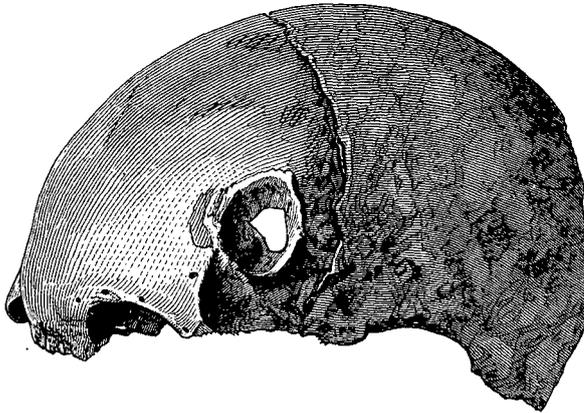


Fig. 3. Skull from Cist at Mountstuart, Bute, $\frac{1}{2}$.

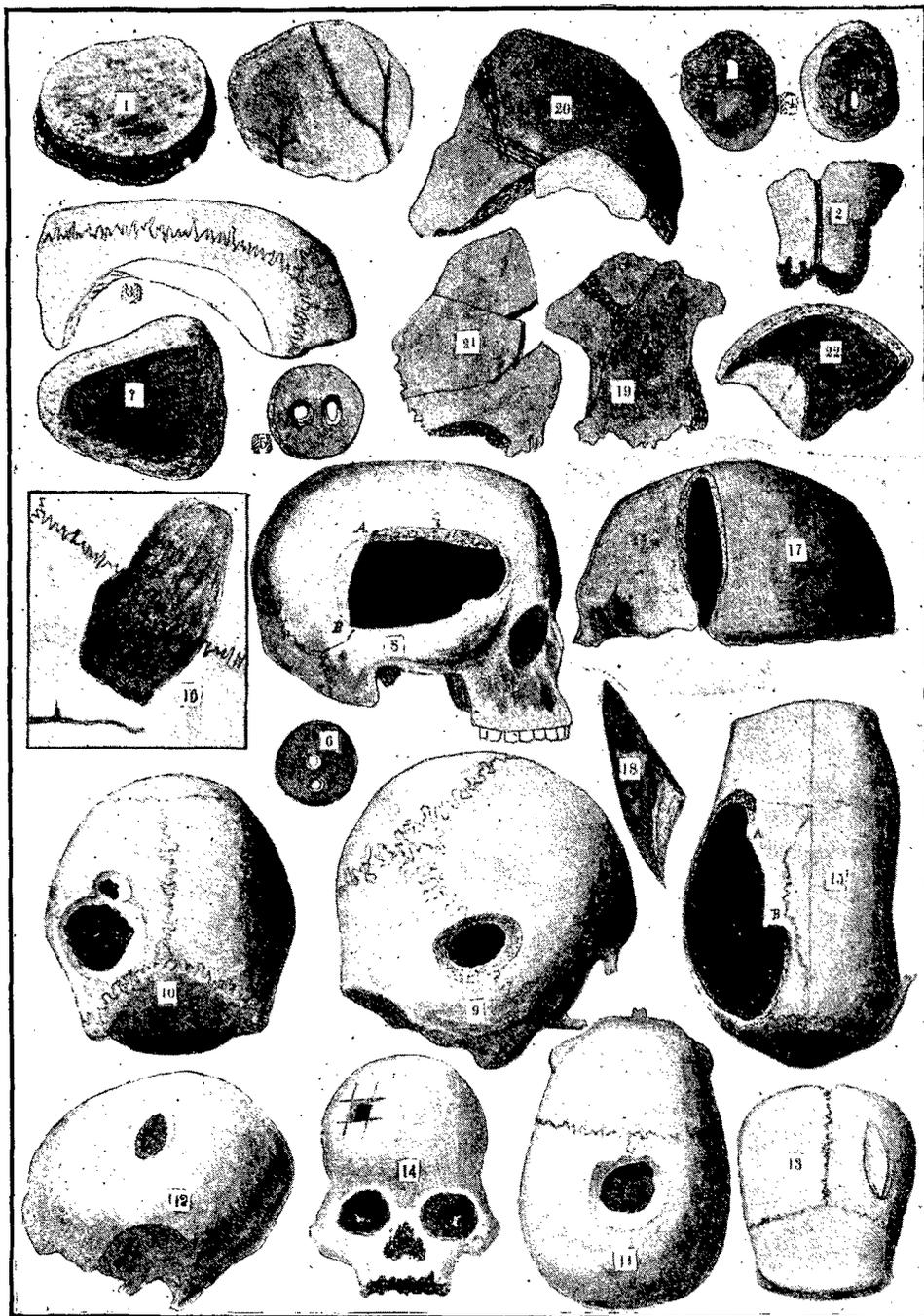
immediately above the temporal fossa, and its anterior margin, which just overlaps the temporal ridge, is exactly 1 inch from the outer angle

of the orbit. The exterior edge of this concavity, which measures about an inch in diameter, is slightly raised above the normal surface of the surrounding bone, and presents an appearance somewhat like an everted lip. This feature is particularly noteworthy, as it is the result of a pathological process which could only take place in the living body. The actual perforation, which does not exceed $\frac{3}{8}$ of an inch in its greatest diameter, takes the form of a bluntly defined triangle bounded with thin edges.

From a careful study of these facts no experienced surgeon, I maintain, could come to any other conclusion than that this perforation had been intentionally performed on the living subject, and that the subject survived the operation for a considerable time, possibly many years. In other words, we have here the unwritten records of a successful case of trepanning in the early Bronze Age; but for what purpose the operation was performed there is no evidence to show.

But however correct this induction may be, it is only a single example on which it is founded, and, consequently, the evidence is inadequate to prove the wider generalisation which it is my object in this communication to establish, viz., that trepanning the human skull for therapeutic purposes was not an uncommon surgical operation among the neolithic inhabitants of Europe. Such a generalisation must be based on a number of examples widely distributed both in space and time. To this evidence I will now briefly refer.

Let me here premise that in opening up this wide and interesting field of research, I have another object to serve besides substantiating the grounds of my thesis, and that is to illustrate the methods of comparative archæology—a purpose for which the details of this subject are singularly well adapted. In emphasising the importance of this department of archæology, it must not be understood as if I were depreciating the function of the local collector, or casting reflections on the prominence given to the collecting of facts in our Scottish School of Archæology. There can, indeed, be no antagonism between these two departments. The one superintends the gathering of the materials, the other the structure that is reared out of them. Indeed, without the former, the latter could not exist at all. But for either, or both, of these



Trepanned Skulls from Prehistoric Burials.

purposes it was essential for me to secure an example of a trepanned skull in Scotland, as without that, it would appear as if I were forcing on your notice a purely continental subject.

To an incident that occurred at the meeting of the French Association for the Advancement of Science, held in August 1873 at Lyon, must be referred the starting-point of these remarkable investigations. Dr Prunières of Marvejols (Lozère), already well known for his researches among the dolmens in his neighbourhood, exhibited at the Anthropological Section of that meeting an oval piece of bone, 2 inches long by $1\frac{1}{2}$ broad, artificially made from the parietal bone of a human skull. The two surfaces of this "rondelle" were natural, but its surrounding margin was bevelled at the expense of the upper surface, and worked with care (Plate I. fig. 1). It was found by Dr Prunières himself inside a skull from one of the dolmens of Lozère. This skull had a large lateral aperture about the size of a man's hand, and its interior was filled with earth. It was while removing this earth through the said aperture that the "rondelle" dropped out. The first idea that suggested itself to Dr Prunières was, that this worked piece of bone was the part of the skull awaiting, but upon careful comparison of the two he came to the conclusion that this could not be the case, as they differed in colour, density, and thickness. There was, therefore, no alternative to the opinion that it was intentionally put there, but for what purpose was to him an enigma.

Among the anthropologists then assembled at Lyon, this bit of bone excited no small amount of curiosity, but they could offer no natural explanation of its meaning, as none of them had ever before seen anything of the kind. Ultimately, Dr Prunières himself suggested that it might be an amulet—a suggestion which became somewhat strengthened in his own mind by recollecting that, in the course of his explorations, he had seen other cranial portions which, it then occurred to him, might have been used for a similar purpose. On his return home he searched through his large collection of bones, and came upon a fragment which, though very dissimilar to that exhibited at Lyon, furnished him with a corroborative link in the amulet theory as to the use of such relics. From Plate I. fig. 2, it will be seen that this new amulet has neither an oval shape nor a skilfully worked margin. It has, however, a notch at two

opposite sides, and a groove on both surfaces connecting the two notches, evidently for the purpose of enabling the owner to carry it about with him suspended by a string.

During the winter months Dr Prunières collected a large number of additional specimens of these cranial amulets as well as skulls showing artificial loss of substance, from which the former were supposed to have been manufactured. These materials he worked up into an important memoir to the Society of Anthropology of Paris, which was read on the 5th March 1874. From this communication it would appear that Dr Prunières, as early as 1865 (*Bulletins, &c.*, p. 319, 1868), found in a dolmen near Aiguères a cranium from which an enormous portion had been intentionally removed, the artificial character of this operation being clearly indicated by marks of cutting and sawing all round the margin, except on one small portion which looked as if it had been polished (Plate I. fig. 3). At that time Dr Prunières entertained the belief that this skull had been so fashioned for the purpose of being used as a drinking-cup—a purpose traditionally ascribed to various savage races. Livy tells us that the Gauls were thus wont to celebrate their victories (book xxiii. chap. 24). Herodotus (iv. 65) says the Scythians did the same. In the same sepulchre he collected no less than five cranial fragments, all more or less worked, which he considered to have been the débris of the cup-making process. But since the amulet theory was broached he abandoned this idea, and henceforth looked upon all the perforated skulls as the work of amulet searchers.

While these investigations were being vigorously prosecuted in the south of France, Dr Paul Broca, who, by the way, was quite conversant with the results of Dr Prunières' researches, was invited by Baron de Baye to visit the artificial caves then brought to light and investigated by him in the valley of Petit-Morin (Marne). These caves were rectangular chambers cut out of the soft chalk, and it would appear that some had been used as dwellings and others as sepulchres. The people who lived and died here did so entirely within the neolithic period, a fact which was amply demonstrated by the kind of relics collected. Dr Broca's visit to Petit-Morin was made in company with MM. de Mortillet and Lagneau (just at the very time that Dr Prunières

had forwarded his memoir to the *Société d'Anthropologie*) with the special object of examining some very rude but curious sculpturings in bas-relief of human figures and other objects which were to be seen on the chalk walls of some of the chambers. After inspecting several of the caves they were conducted to Château de Baye, where the skulls, bones, and other relics, collected in the course of the explorations, were carefully preserved, and formed, in the words of Broca, "un véritable musée." In one of the cases they were shown a "rondelle" made of a human skull, which was at once recognised as analogous to the one exhibited at Lyon, differing from it only in being pierced with a small hole for suspension (Plate I. fig. 4).

To Dr Broca himself must be ascribed the next, and perhaps the greatest, step in advance in the solution of these novel researches. On his return to Paris he carefully examined the specimens sent by Dr Prunières to the Anthropological Society, and, for the first time, recognised that the so-called polished portions round the margin of some of the cranial amulets were due to cicatricial deposits—the result of a pathological action in the living body—and not the effect of any polishing process at all. With this clue he was able to perceive clearly that many of these amulets, as well as the apertures in the perforated skulls, indicated two separate interferences on the part of man, one before and the other after death—two distinct operations which he designated as *trépanation chirurgicale* and *trépanation posthume* (*Bull. de la Soc. d'Anthrop.*, 2nd July 1874 and 4th May 1876).

This distinction gave a wider interest to these cranial investigations, and henceforth French archæologists were busily employed in collecting and recording additional facts. At a later period of the same year (August 1874) Dr Prunières read another memoir on his discoveries at the meeting of the Association for the Advancement of Science then held at Lille. Also at the meeting of this association held in the following year at Nantes, the subject was reopened for discussion by MM. Chauvet and Gassies. M. Babert de Juillé, Conservator of the Prehistoric Museum at Niort, published a brochure with the purport of showing that a perforated skull found in 1840 in the Dolmen de Bougon (Deux-Sèvres), which was still preserved in the museum, was

a case of surgical trepanning. This skull when discovered had been examined by Dr Sauzé, who came to the conclusion that the perforation was the result of a battle wound which had not immediately proved fatal. Also Baron de Baye, having carefully scrutinised the extensive materials in his possession, published early in 1876 a pamphlet entitled *La Trépanation Préhistorique*, in which he showed that at Petit-Morin there were not only several amulets, some perforated (Plate I. figs. 5 and 6) and others unperforated (Plate I. fig. 7), but also a number of skulls from which part of their substance had been intentionally removed. Nor did the subject lie dormant in the hands of Dr Broca. Among the large osteological collection in the museum attached to his laboratory in Paris was a series of skulls from the famous sepulchral cavern de l'Homme Mort (Lozère), a report of which he had already published in the *Revue d'Anthropologie* for 1873. All the skulls from this sepulchre were of an extremely dolichocephalic type, and two or three of them he now recognised as true examples of surgical trepanning (Plate I. fig. 8). In the course of his studies he further ascertained that analogous perforations in the parietal bones might be congenital, and in elucidation of this point he contributed two papers to the Society of Anthropology (*Bull.*, pp. 192, 326, 1875).

Such was the general progress and tendency of these investigations when the International Congress of Anthropology and Prehistoric Archaeology was held at Buda-Pesth in September 1876, at which Dr Broca in a most masterly manner reviewed the whole subject up to date. The paper was entitled "Sur la Trépanation du Crâne et les Amulettes Cranniennes à l'époque Néolithique," and its general purport is thus defined by the author:—

"Je me propose d'établir les deux faits suivants :

"1°. On pratiquait à l'époque néolithique une opération chirurgicale consistant à ouvrir le crâne pour traiter certaines maladies internes. Cette opération se faisait presque exclusivement, peut-être même exclusivement sur les enfants (*trépanation chirurgicale*).

"2°. Les crânes des individus qui survivaient à cette trépanation étaient considérés comme jouissant de propriétés particulières, de l'ordre mystique, et lorsque ces individus venaient à mourir, on taillait souvent

dans leurs parois crâniennes des rondelles ou fragments qui servaient d'amulettes et que l'on prenait de préférence sur les bords mêmes de l'ouverture cicatrisée (*trépanation posthume*)."

At the conclusion of this communication Prof. Virchow announced himself as a convert to Dr Broca's opinions :—" Je ne crois pas," said he, " que l'on puisse donner aucune autre explication de ces faits. Nous avons gagné par là un nouveau territoire à la science et je constate que nous venons de faire un grand pas dans l'anthropologie préhistorique."

The almost immediate effect of the publicity and interest given to the subject of Broca's exhaustive memoir and specimens was to deprive France of her monopoly in these researches. Since then examples of trepanned skulls and cranial amulets have been announced from nearly every kingdom in Europe. Nor do they appear to be restricted to any particular race or period. Skulls showing undoubted evidence of having been subjected to the operation of trepanning during life are found among dolichocephalic and brachycephalic types; while their chronological range embraces all phases of European civilisation from the earliest neolithic period down to the dawn of historical times. In France the recorded instances have so increased that, except for statistical purposes, they cease to be of any significance. M. Nadaillac states (*Bull. de l'Acad. des Inscip. et Belles-Lettres*, tom. xiv. 4^e S. p. 281) that in 1885 the collection of Dr Prunières alone contained 167 specimens of perforated skulls, or fragments of such skulls. In continuing my narrative of the subsequent progress of these discoveries, it will be necessary, in order to keep my sketch within due limits, to adopt some selective process in the arrangement of the materials at my disposal. My descriptive cases will, therefore, be as far as possible selected for some special purpose, such as defining the geographical area in which the custom prevailed, or illustrating some new feature in the operation itself which may ultimately help to explain the object for which trepanning was resorted to.

First of all let us take a more careful glance at the osseous remains from the sepulchral caves of Petit-Morin, which, next to the dolmens of Lozère, supplied Broca with the most characteristic specimens for his Buda-Pesth exposition. Writing in 1888, Baron de Baye informs us (*L'Archéologie Préhistorique*) that the neolithic stations of the Marne

district yielded eight skulls in a perfect state of preservation which had suffered more or less of a loss of substance, the intentional character of which could not be disputed. One of these (Plate I. fig. 9) is that of a young person (brachycephalic), and shows an oval perforation over the right lambdoidal suture measuring $1\frac{3}{4}$ by $1\frac{3}{8}$ inch. There is no trace of cicatrization, although the orifice has the characteristic bevelled margin, and hence we must conclude either that the individual died during the operation, or that the operation was a *post-mortem* performance. Another, that of a full-grown person (mesocephalic), had the operation performed right across the coronal suture. The perforation measured about $1\frac{1}{4}$ inch in diameter, and it was clearly proved by Broca that the patient survived the operation for a long time. A third example (brachycephalic) had a perforation in the left parietal bone, about an inch behind the coronal suture, somewhat similar in size and appearance to that just described. The skull indicated an aged person, and the lesion had completely cicatrized. "L'état de l'individu indique un âge avancé; les sutures sont ossifiées complètement, la perte de substance est le resultat d'une trépanation chirurgicale. Le travail de réparation est complet. En effet, les ouvertures diploïques sont obstruées contrairement à ce qui se voit sur les fragments crâniens qui ont été enlevés après la mort" (*Ibid.*, p. 167). A fourth skull, also of an aged person, shows that it had been twice operated on, and that the individual survived both operations. The perforations (Plate I. fig. 10) are close together on the left parietal bone, one of which is large, measuring no less than $2\frac{1}{8}$ by $1\frac{3}{4}$ inches. Of the entire series of trepanned skulls from Petit-Morin only four showed that the individuals survived the operation; the rest had the appearance of having been operated upon after death. As an illustration of the extent to which these *post-mortem* interferences were carried, Baron de Baye figures one skull from which the entire upper portion of the cranium had been sawn or cut away.

As to the cranial amulets in Baron de Baye's collection, some were round discs like buttons perforated with two small holes (Plate I. figs. 5 and 6). One was roughly triangular in shape with a highly bevelled margin (Plate I. fig. 7), and the others were of different shapes.

Out of 44 selected typical skulls from the caves of Petit-Morin, sent

to Broca for examination, 28 belonged to males and 24 to females, while 2 were uncertain. Also of this number 4 were brachycephalic, with an index not less than 83.33; 10 were dolichocephalic, with an index not exceeding 75; and the remaining 30 ranged in a regular gradation between these extreme points.

The sepulchral caverns of Baume-Chaudes (Lozère), explored by Dr Prunières (*Bull. de la Soc. d'Anthrop.*, p. 206, 1876), yielded an enormous quantity of human bones. The number of so-called "rondelles" and trepanned skulls from this vast ossuary amounted to 60. Among them was detected a curious relic made of the skull of a deer, which being circular and perforated was supposed to have been a forged amulet. The people here appeared to be an unmixed race of an extremely dolichocephalic type having a cephalic index of 70 to 73. Out of 60 complete skulls collected there was not one of a brachycephalic type.

The discovery of a portion of a trepanned skull from the rock-shelter of Entre-Roches, near Angoulême (Plate I. fig. 21), has led to some controversy, as it was first reported to have been found associated with characteristic relics of the palæolithic period. This assertion was, however, quickly disproved, but the case is interesting as furnishing some evidence that the operation was performed for the purpose of removing a necrosed bone. If this opinion be well founded, the patient must have succumbed to the operation, as there were no signs of a cicatricial reparative process having been begun (*Bull. de la Soc. d'Anthrop.*, p. 12, 1877).

In a series of artificial caves at Tertre-Guerin (Seine-et-Marne) a large assortment of the industrial remains of an early neolithic people has been brought to light, consisting of stone hatchets, flint implements, hammerstones, horn casings for stone celts, together with many other portions of worked horn and bone. This race, judging from the osseous remains, would appear to have been strong and muscular, but of a somewhat low type. Several of the leg bones showed various degrees of platycnemism, the olecranon process of the arm bones was pierced in the proportion of 24 per cent., the eyebrows were prominent, the chins square and somewhat prognathous, &c. Only one skull belonging to the male sex was so perfect as to give correct measurements for determining the cephalic

index, which in this instance turned out to be 82; but another, that of a female, gave an index as high as 86.50, figures which, of course, indicate a brachycephalic race. But the most interesting specimen among the osseous remains was a portion of an aged man's skull showing on its crown a trepanned aperture about $1\frac{1}{2}$ inch in diameter. The margin of this perforation was very much bevelled, its surface was smooth and velvety, and its cellular tissues were greatly infiltrated with cicatricial deposits (*Materiaux*, vol. xii. p. 317, 1877).

In 1881, Professor Parrot described an interesting case of trepanning from the neolithic cemetery of Bray-sur-Seine (Marne). The tissues surrounding the perforation in this skull exhibited some special pathological phenomena, which, in the Professor's opinion, justified the inference that the operation had been performed for a purely surgical purpose, probably to give exit to accumulated pus. Around the seat of the operation there was evidence of an extensive ostitis, the cause of which he assigned to a traumatic wound (*Bull. de la Soc. d'Anthrop.*, p. 104, 1881).

A skull found by M. Gaillard in one of the dolmens of Port-Blanc at Saint-Pierre de Quiberon (Morbihan), and described by him in 1883, presented an artificial aperture, measuring $2\frac{3}{8}$ by 2 inches. The margin of this opening indicated that the bone had been removed on one side by a scraping process, while the opposite side showed an abrupt edge as if a cutting instrument had been used (*Fouilles des Dolmens du Port-Blanc*, p. 7). Dr Parrot, who carefully examined this specimen, came to the conclusion that this operation was also of a surgical character, and had been performed to relieve pressure on the brain due to pus, which had accumulated in consequence of a wound (*Dictionnaire des Sciences Anthropologiques*, p. 1073).

In the sepulchral chamber of a tumulus in the Commune de Guisseny (Finistère), a trepanned skull was found associated with a rude urn to which four handles were attached, a bronze poignard, and some other articles of bronze. The skull had on its right side an oval-shaped perforation 1 inch long by $\frac{3}{8}$ of an inch broad, which displayed abundant traces of cicatricial deposits (*Mémoires de la Soc. d'Émulation des Côtes-du-Nord*, 1883).

From a dolmen near Sainte-Affrique (Arveyron), M. Cartailhac extracted a small brachycephalic skull having two artificial perforations, one of which he considered to have been executed before and the other after death. This skull was one of four from the same dolmen, and among the other human bones were platycnemic tibias and perforated olecranons. The associated relics were scanty but of a decidedly neolithic character. In many respects the race of people here represented resembled that inhabiting the caves of Tetre-Gucrin already referred to (*Bull. de la Soc. d'Anthrop.*, Lyon, 1883).

Another example of double trepanning has been notified by Dr Topinard from the sepulchral grotto (neolithic) of Feigneux (Oise). This was a dolichocephalic skull, and showed traces of an operation before and after death (*Bull. de la Soc. d'Anthrop.*, p. 527, 1887, and *Revue d'Anthrop.*, p. 243, 1888).

A trepanned skull, that of an old man, from the tumulus of Lizières (Deux-Sèvres), discovered by Souché, has given rise to a considerable amount of discussion among anthropologists. MM. de Mortillet, Berchon, Quaterfages, and Prunières, having carefully examined it, came to the conclusion that the operation had been begun but only partly performed during life, that it was then suspended for a time, and subsequently completed at or immediately after death. The form of this perforation was that of a parallelogram, and this, together with some marginal features and markings, enabled these savants to agree on the opinion that the instrument used was made of metal, and that the method of manipulation was a gentle sawing process (*Dictionnaire des Sciences Anthrop.*, p. 1073).

In 1889, M. Ad. de Mortillet described at the Society of Anthropology the results of the exploration of the *Allée Couverte de Dampont* (Seine-et-Oise). The industrial remains found here were of the ordinary neolithic character, and included the following:—Two polished stone hatchets; some scrapers, borers, and flakes of flint; one or two bone pointers, and portions of deer's horn; a conical shell (*Patella*), pierced at the apex with three small holes; some fragments of pottery. Among a quantity of osseous remains were three fragments of human skulls which had been subjected to one or other of the forms of trepanning.

The first is a case of *trépanation chirurgicale*, and shows a partially cicatrized perforation on the right temple, measuring $1\frac{1}{8}$ inch by $\frac{5}{8}$ of an inch, which, according to M. de Mortillet, had been effected by scraping the bone with a flint instrument. The second specimen is the left side of a skull which had undergone a *post-mortem* section of an elongated portion of bone $3\frac{1}{2}$ inches long from the temporal region (Plâte I. fig. 17). The third, reckoned by the author as a cranial amulet, is an irregularly shaped portion of a skull with a partially cut margin (*Bull. de la Soc. d'Anthrop.*, 1889).

M. Pilloy explored a Frankish cemetery in a field near St Quentin, which, in his opinion, had been abandoned as a burial-place about the 10th or 11th century. One of the graves examined contained a trepanned skull, associated with comparatively modern objects, such as a buckle and an iron knife, articles which he assigned to the 6th century. The skull was dolichocephalic (Plate I. fig. 11), and belonged to a man of middle height, and of the age of 55 or 65 years. The perforation was near the summit, and presented a highly bevelled margin containing cicatricial deposits of long standing (*Materiaux, &c.*, vol. xxi. p. 272).

M. Borrel, an architect and a distinguished archæologist in Savoy, while excavating cellars at the hospital of Montiers, came upon a series of stone cists or graves which he judged to be not earlier than the 10th century. One of the graves contained the skull of an adult man, which presented on the right parietal bone a slightly oval perforation about $1\frac{1}{2}$ inch in diameter. The edges of this opening are described as “*rugueux, régulièrement amincis, obliques, taillés aux dépens de la table externe en un biseau aigu, tranchant.*” According to M. Borrel, the trepanning was undoubtedly performed before death for therapeutic purposes, and very probably by the method of scraping (*Revue Mensuelle*, p. 63, 1891).

M. Chouquet of Moret (Seine-et-Marne) has explored in the Commune of Ecuelles a sepulchre containing undoubted evidence of interments, both after the manner of simple burial and cremation. Among the partially cremated bones was a portion of the parietal bone of a trepanned skull showing a falciform bit of the cicatrized margin of the

perforation. Another carbonised bone, also a portion of a parietal bone, indicated a posthumous operation (*Bull.*, &c., 18th May 1876).

In 1873 a skull was found in the tumulus de Nôves (Alpes-Maritimes), belonging to the Bronze Age, which had a peculiar perforation in the frontal bone, then supposed to be the result of a wound. It was deposited in the museum at Cannes, and it was only after attention had been directed to Broca's opinions that it was recognised as a case of trepanning (*Mémoires de la Soc. des Sc. Let. et Arts de Cannes*, 1878).

Three trepanned skulls and a cranial amulet are recorded as having been found in Stone-Age graves at Saint-Martin-la-Revière (Vienne) (*Materiaux*, &c., vol. xviii. p. 301). Two other examples of trepanned skulls are also notified as being found in this department (*Ibid.*, vol. xix. p. 207).

I have hitherto confined my notices to the discoveries made in France ; but, as previously mentioned, analogous phenomena have been recorded from almost every country in Europe.

In the year 1886 there were two skeletons exposed in a grave at Limet, near Liège, over which an enormous stone slab lay as a covering. One of these bodies was observed to have its skull trepanned. The only relics found in this grave were a few iron nails and traces of wooden boards, so that one of the bodies at least must have been enclosed in a wooden coffin. The trepanned skull was that of a man some 40 or 50 years of age, and the operation had been performed on the left parietal bone. The perforation was of the shape and size of a pigeon's egg (*Plate I. fig. 12*), with bevelled edges, and distinct traces of reparation in the cellular tissues of the surrounding bone. According to Dr Liebrecht, who carefully examined this specimen, there could be no doubt that the operation had been intentionally performed on the living subject for therapeutic purposes (*Materiaux*, &c., vol. xx. p. 60).

Baron de Baye (*Arch. Préhistorique*, p. 149) instances, as a case of trepanning from Denmark, a skull found in a dolmen at Noes, in the island of Falster, which contained a large opening measuring $2\frac{1}{8}$ by $1\frac{3}{4}$ inches. According to Engelhardt, however, this aperture was not the result of an intentional trepanning, but of an accidental wound from which the patient recovered.

At the International Congress of Archæologists at Buda-Pesth (1876), M. Schaaffhausen stated, in the course of the discussion which ensued over Broca's celebrated paper on this subject, that he possessed the skull of a young Roman girl, taken from a grave at Trèves, showing an aperture which must have been intentionally made before death, as the wound had just commenced to cicatrize. On the same authority it was announced that a cranial amulet had lately been found in a tumulus in Thuringia. Also M. Montelius stated that in 1874, he and M. Retzius explored a grave of the late Stone Age at Karleby in Vester Götthlande in which they had found a skull containing a round hole, which was pronounced by the latter (M. Retzius) to have been made before death. But the interest attached to the subject was not then known to them, and so the point passed over without further inquiry.

In several of the Swiss lake-dwellings (Gerlafingen, Sutz, Schaffis, and Locras) cranial segments, supposed to have been used as drinking-cups, have been from time to time turned up from amidst their debris, but only one station, viz. Locras, has yielded an example of a trepanned skull (*Lake-Dwellings of Europe*, pp. 537, 542). The case, however, comes under the category of posthumous, as the margin of the perforation is not bevelled but clean cut, and there is no evidence of cicatrization. The only other relics suggestive of the custom of trepanning among the lake-dwellers are a few cranial amulets and "rondelles." One of the latter, perforated with two small holes, is figured in my recent work on the lake-dwellings (fig. 185, No. 20).

Dr Wankel (*Mitt. der Anth. Gesellschaft in Wien*, 1876-7) states that he had seen in the museum of Prague two trepanned skulls from Bilin, in Bohemia, both of which gave indications that the operation had been successfully performed on the living subjects. The same author describes another very interesting case from the grotto of Byciskala, also in Bohemia. Here, in the course of some exploratory excavations, the skeleton of a girl about 12 years of age was disinterred. The body had on each arm a bronze bracelet, and near the neck lay some beads of green glass. The skull was brachycephalic, and presented clear evidence that it had been trepanned on the right side of the frontal bone, but the wound showed only slight traces of cicatrization. The actual perforation was

small, only about $\frac{1}{2}$ an inch in its greatest diameter, but the depression scooped out of the bone exceeded an inch in diameter. The case, indeed, bears a striking resemblance, both in position and in the appearance of the perforation, to the Scottish example from Mountstuart now before you.

The Berlin anthropologists had also some cases brought under their notice, one, from the cemetery of Giebiechenstein in Saxony, being figured in their Proceedings (*Zeit. für Ethnologie Verhand.*, p. 65, 1879).

M. Nadaillac informs us that (*Acad. des Inscript. et Belles-Lettres*, p. 286, 1886) in 1878 Professor Mantegazza presented to the Italian Society of Anthropology the cast of a skull found at Bogdanoff in Russia which bore traces of two operations, one performed during life and the other after death. On the same authority I find it stated that two skulls taken from the dolmens at Roknia in Algeria, and given to the museum of the *Société d'Anthropologie*, were found by Dr Broca to have been trepanned (*Ibid.*, p. 289).

In the course of exploring one of the natural caves of Césaréda, on the right bank of the Tagus, near Lisbon, known as Casa da Moura, a large quantity of human bones, representing some 150 individuals, was discovered. It would appear that the neolithic inhabitants had converted this grotto into a cemetery, thus accounting for the large number of bodies it contained. The bones were much decayed, only three or four complete skulls being amongst them, which so far indicated a dolichocephalic race. The upper portion of a skull (Plate I. fig. 13) is of exceptional interest, inasmuch as it furnishes positive evidence of having been partially trepanned, thus disclosing the initiatory stages of the method adopted in the attempt. On the upper part of the left parietal bone there is a deep groove in the form of a pointed ellipse, 2 inches long by $\frac{3}{4}$ inch wide, defining a corresponding piece of the skull still *in situ*. The upper plate had been cut through by a flint implement, which, it would appear, had been used in a sawing manner—an inference founded on certain marks on the edges of the groove. The intention of the operator was, either to get access to the brain so as to clear out its contents preparatory to preserving the skull as a trophy, or to secure the circumscribed portion of bone as an amulet, but for some cause or other the operation had

never been completed. If, however, the operation so far had been performed on the living subject, of which there is no evidence, the patient must have died in the hands of the surgeons. In this case it would show that scraping the bone, as advocated by Broca, was not the only method of trepanning practised among the neolithic people (Cartailhac, *Les Ages Préhistoriques de l'Espagne et du Portugal*, p. 84, Paris, 1886).

Before bringing these records to a close let me just observe that phenomena of a somewhat analogous character have been recorded from regions beyond the confines of the Old-World civilisations of Europe. Indeed, the earliest case of an old trepanned skull brought under the notice of European anthropologists is the well-known one from the Inca cemetery of the valley of Yucay, Peru (Plate I. fig. 14). It was submitted by Mr Squier to the best surgeons in the United States and Europe; and by all it was regarded as a remarkable evidence of surgical skill in pre-Columbian times (*Incidents of Travel and Explorations in the Land of the Incas*, pp. 457, 577). It was exhibited and described by Dr Broca at a meeting of the Anthropological Society of Paris in 1867, thus preceding the discoveries of Dr Prunières by six or seven years (*Bull.*, &c., p. 403).

On the left side of the frontal bone of this skull there was noticed a rounded space nearly 2 inches in diameter, which presented a whiter appearance than the rest of the surrounding bony surface. In the centre of this space there was a rectangular hole, measuring 15 by 17 millimetres, neatly cut out of the bone by making a linear incision along each of its four sides, the marks of which were still to be seen as deep cuts projecting from the corners of the aperture. Broca came to the conclusion that the white spot indicated the exact part of the bone which had been denuded of its periosteum preparatory to the operation. The osteitis set up by the excision of the piece of bone did not therefore include the portion of skull denuded of its periosteum, as it was thereby deprived of its blood-vessels, and, consequently, retained a bleached-like appearance. According to Broca and Nelaton, the subject of this operation could only have survived from seven to fifteen days.

More recently Mr O. T. Mason describes a posthumous case from the

same country. In a grave at Chaclacayo, near Lima, were found three mummies—a man, a woman, and a child; and beside them lay a skull which exhibited near the middle of the forehead a polygonal aperture $2\frac{1}{2}$ inches long by 2 inches broad. The piece of bone had evidently been removed with a blunt instrument, and the various incisions by which this was accomplished, some eight in number, could be readily traced round the margin of the opening (*Proc. U. S. Nat. Museum*, p. 410).

Dr Fletcher, in an article on prehistoric trepanning (*Contributions to North American Ethnology*, vol. v., 1882), notifies several instances of trepanned skulls from various mounds in North America, as at Devil River, Michigan, Sable River, near Lake Huron, Great Mound on the River Rouge, &c. But all these are mere posthumous operations with round holes bored in the skulls, and appear to me to have little or no analogy to the true surgical operation of the neolithic people of Europe. It may also be noted that cranial amulets have not yet, so far as I know, been recorded from the other side of the Atlantic.

Trepanning the human skull has been more or less practised since the earliest historical times. Hippocrates refers to the operation as one of great antiquity, and as being frequently resorted to by the Greek surgeons. From the reports of travellers it would appear that the practice is still prevalent among many primitive people, as, for example, the Ainos, Negritos, Tahitians, and other tribes in the South Sea Islands (Nadaillac, *loc. cit.*; *Bull. de la Soc. d'Anthrop.*, p. 619, 1875.) The Rev. Samuel Ella, a missionary at Uvea, one of the latter, gives a description of the method of performing the operation. A T incision is made on the scalp, and then the bone is scraped with a piece of glass till a hole is made in the skull (*Med. Times and Gazette*, 1874). According to Baron Larrey, the Kabyles, the descendants of the ancient Berbers, now almost confined to the southern range of the Atlas Mountains, have practised trepanning from the most ancient times, and the practice still finds favour among them. The operation is performed by metal instruments, and is resorted to for therapeutic purposes, such as fracture of the skull, disease of the bones, and pains in the head (*Bulletin de l'Acad. de Médecine*, vol. xxxii. p. 87). Baron de Baye states (*Arch. Préhistorique*, p. 151), on the authority of a quoted work on Montenegro (*Le Monté-*

négro, le Pays et les Habitants, Paris, 1844), that the Montenegrins were in the habit of getting themselves trepanned for the most trifling ailments, a simple headache being considered a sufficient reason for sending for the local *Rebouteur*. Also that the operation was often repeated on the same person sometimes to the extent of seven or eight times "sans inconvenient pour leur santé."

From these and other considerations it would appear that such interferences with the cranial wall are not so dangerous to life as we might suppose from the results of the operation of trepanning in modern surgery.¹ In support of this opinion, I may here notice an observation made by Dr Prunières (*Association Française*, p. 623, 1874) that the shepherds in his neighbourhood were in the habit of trepanning the skulls of sheep affected with a disease called "*tournis*." This custom seems to be widely known, and still practised in many pastoral districts.²

I have now laid before you a brief epitome of the facts and phenomena which I regard as sufficient evidence of the correctness of my general thesis. For the present exposition of them I claim neither exhaustiveness of the materials nor originality in their interpretation. My labours are entirely of a literary character, and it is quite possible that I have omitted some illustrations which a more careful search of the records would have revealed, while it is still more probable that

¹ It is curious to note that the tendency of modern surgery in this country is to advocate the operation of trepanning for other than traumatic diseases of the skull, a result which is probably due to the greater progress made in determining the distribution and localisation of brain function.

² On this subject the well-known agriculturist, Mr James Macdonald, kindly sends me the following note:—"The practice you refer to is still in use in Scotland. Many a time I have helped in the operation. It is performed to cure a disease called 'Sturdy,' caused by a species of parasite (*Cœnurus cerebralis*) in cysts or bladders containing fluid, which lodge in the brain. The portion of the skull immediately overlying this cyst or bladder becomes soft, and this soft portion is punctured and the cyst removed. I have seen a portion, nearly a square inch, cut out, and a bladder larger than a thimble removed. When performed in good time, and with skill and care, this operation is often quite successful. It is not practised so much as formerly; the majority of farmers now think it better to at once slaughter the affected animal.

"The cutting of the skull seemed to do little or no harm to the animal—the difficulty lies in the fact that the cysts often lodge in positions which cannot be easily reached" (Royal Dublin Society, 13th Nov. 1891).

there are others lying in our various museums which have hitherto escaped observation. But these are immaterial points, as no statistical efforts could, in the present state of our knowledge, produce a sufficiently comprehensive basis for determining the extent to which the practice of trepanning was carried on by the various races of prehistoric times. Till now Scotland, if not the whole of the British Isles, would have been altogether excluded from the archæological area of its occurrence—a result which would have been due to sheer want of attention to existing materials. The absence of recorded cases in other provinces and districts in Europe may also be similarly accounted for. On the present occasion I am only concerned to prove that the practice did actually exist in these early times, and with the practical illustration now before you, as well as the numerous instances I have just described on the authority of some of the ablest anthropologists of this century, I think the problem may be accepted as demonstrated. With its acceptance the further phases of this inquiry may be said to rise into a higher sphere than that generally assigned to prehistoric archæology. The simple question, why or for what purpose was this operation then performed? brings us into direct contact with our present civilisation. Were the motives that guided the hand of the neolithic operator inspired by therapeutic exigencies or by religious sentiments? Was the result of the operation to benefit the individual in this or in a future world?

According to Broca, the operation on the living subject was performed almost exclusively on children, without any distinction as to sex, who, as a rule, survived the operation for many years, and sometimes lived to an advanced age. This opinion he supported by several arguments. Among others, the facility and comparative freedom from fatal consequences with which the operation could be accomplished in early youth, while the bones were yet soft and not completely ossified. To show the force of this argument, Broca experimented on different skulls, using bits of glass instead of flint, and with these he scraped a hole in the skull of a two-year old child in four minutes, while a similar result on that of an adult took him fifty minutes. Another ingenious argument was the following :—His critical eye one day discovered that a trepanned skull in his laboratory was unsymmetrical (Plate I. fig. 15). The

sagittal suture was observed to be out of the mesial line, and to be bent towards the trepanned aperture. This deviation was evidently due to the operation, and Broca pointed to the result as conclusively proving that it had been performed while the bones were sufficiently plastic to yield to such a disturbing force.

As to the manner of operating, all suggested or possible methods were rejected except that of scraping the bone with a flint till a perforation was effected. This was undoubtedly the most common method adopted, and it is the only one which satisfactorily accounts for the characteristic appearance of the large majority of perforations—the scooped surface, irregularly oval or round shape, and bevelled margin, being inexplicable on any other reasonable hypothesis. Since Broca's time, however, one or two exceptions have been noted, as those from Lizières and Casa da Moura (Plate I. fig. 13), but they are so few and of so undecided a character as to justify the conclusion that the scraping process had been the rule.

As to the selection of a particular spot for the operation there was evidently no fixed rule, and the perforation may be found on any part of the head, on the body of a bone, or across a suture. It would appear, however, that the forehead was purposely avoided, so as to prevent disfigurement of the face.

It is in propounding an hypothesis as to the object for which the operation was performed that Dr Broca has supplied the most novel suggestions. He believed that in the main the operation was resorted to for therapeutic purposes, chiefly to relieve mental disorders, as epilepsy, convulsions, lunacy, &c. We now know that many of the convulsions of early childhood, such as those due to dentition and other physiological causes of a temporary character, disappear in adult life without any specific treatment. But it cannot be supposed that medical science in those days was so far advanced as to distinguish between the varieties of epileptiform diseases. Such diseases were in all likelihood then considered to be due to some supernatural or demoniacal agency that had taken hold of the individual—a superstition which has found credence in all ages of the world's history, if, indeed, it is yet extinct even among our so-called civilised nations. People looked upon the spasms and contortions of a convulsive attack as a manifestation that an

evil spirit was confined within the skull and struggling for freedom. With such a preconceived notion, or perhaps as an article of long cherished faith, what could be more natural than to suppose that by boring a hole in the prison walls they would be facilitating the escape of the evil spirit? In support of this theory, Dr Broca quotes an author of the 17th century who recommended as a remedy against epilepsy the scraping of a portion of the upper plate of the skull, and sometimes the entire excision of the bone down to the *dura mater*, a practice which he (Broca) considered to be a survival of the still more ancient custom of trepanning (Lehan Taxil, *Traité de l'Épilepsie, Maladie Vulgairement appelée au Pays de Provence la Goultete aux Petits Enfants*, Lyon, 1603). Indeed, scraping portion of the upper plate of bone (Plate I. fig. 16) had in several instances been met with concurrently with some of the perforated skulls and cranial amulets—a fact which had not escaped Broca (*Congrès International, &c.*, p. 178). That it was, however, a distinct operation in neolithic times was shortly afterwards confirmed by further discoveries, notably by a case recorded by M. Guégan from the dolmen of Etang-la-Ville (*Bull. de la Soc. d'Anthrop.*, p. 198, 1878). It would thus appear that both the partial and complete removal of cranial substance had been practised in prehistoric times, though the former only survived to the middle ages as a remedy for epilepsy. Another old remedy for this disease was to administer to the patient some particular part of the skull, such as the *ossa wormiana*, reduced into powder or ashes—a practice which might also have a similar origin. That peculiar medicinal properties were assigned to the bones of the human skull, and that they were used as special remedies for diseases of the head, was further shown by Dr Prunières, who quotes a passage from a work by Nicholas Lemery (*Traité Universel de Drogues Simples*, Paris, 1699) to the effect that preference is to be given to “la crâne d'un jeune homme mort de mort violente et qui n'ait pas été inhumé.”

Dr Bellucci, in the catalogue of his well-known collection of Italian amulets, describes two made of cranial bones which were found in the possession of old men who used them as charms against epilepsy and other nervous diseases (*Catalogue descriptif d'une collection d'Amulettes Italiennes envoyée à l'Exposition Universelle de Paris*, p. 69, 1889).

Dr Prunières, ever since the pathological character of trepanning became recognised, contended that the operation had been occasionally performed for a pure surgical purpose, such as the removal of dead bone, and this opinion he founded on special features of some of the trepanned skulls in his own collection (*Bull. de la Soc. d'Anthrop.*, 16th March 1876). Broca, however, thought the evidence insufficient to justify this conclusion (*Ibid.*, p. 243). The subsequent researches of Dr Parrot, and others, have demonstrated that Dr Prunières was right, and the question may now be accepted as settled in the affirmative (*Ibid.*, 1881-83). But these purely surgical cases are very few in comparison with those which show no lesion whatever in the bony tissues surrounding the perforation. Hence we must conclude that in the majority the primary object of the operation was some mental disorder of an epileptiform character.

Posthumous operations on the skull can be distinguished from those performed on the living subject by several characteristics. The aperture in the former is generally larger, and its outline more irregular; the surrounding edge is perpendicular, or at a slight angle to the surface of the skull, and presents a series of separate cuts or sawing marks, according to the kind of implement used in the operation. The manipulation is altogether rougher, and often leaves gashes and scratches on the surrounding bones. The cuts have also a fresh-like appearance, and never show any cicatricial deposits. But as the latter character requires the subject to be in life for at least some days after the operation, the distinction is not applicable to those who immediately succumb to its effects. The most remarkable fact in regard to these *post-mortem* cases is, that almost invariably there is some part or portion of the edge of the perforation which shows signs of an old cicatrization. This fact suggests the idea that the special reason for the secondary or *post-mortem* interference was to be found in the fact that the individual had successfully undergone the surgical operation (Plate I. figs. 8 and 15). Here at last we have a clue to the motives of these posthumous trepanners, as well as a striking confirmation of the theory which explains the bits taken away as amulets. That at death the skull of such a person would be held in repute as a prophylactic against all diseases assigned to malign influences, is not after all such a far-fetched hypothesis. If so, what could be more

natural than the belief that an amulet would be more efficacious if it retained a small section of the actually cicatrized portion of the trepanned skull. That this was a special character in the selection of these cranial amulets is unhesitatingly affirmed by Dr Broca (*Congrès International, &c.*, p. 147). In looking over the specimens figured by him, I find that the retention of a falciform portion of the cicatrized margin of the old perforation is a constant character in all the irregularly shaped ones (Plate I. figs. 18 and 20). But the great veneration attached to a trepanned skull was not confined to this world, but also extended to that which is to come. Hence, when the posthumous operation was performed—and this, judging from the number of entire specimens that have been collected, would have been comparatively seldom—care would be taken by the relatives of the deceased that some portion of the cicatrization would be left. Evidence of the supernatural favours bestowed on the individual during life was not on any account to be totally destroyed, as it was a passport to the world to come, where it ensured to the owner a place of distinction. For similar reasons we can understand why an amulet would be buried along with the body of its owner. This precious relic or talisman was to accompany him to the future world, where by means of it he could exercise his magic and beneficent powers by keeping malign influences at bay. Sometimes the friends of the deceased went so far as to put the amulet inside the skull, three examples of which are recorded by Dr Prunières, but for what purpose it is hard to say. Baron de Baye describes something analogous to this from the caves of Petit-Morin, where he found several human skulls containing the bones of infants and other objects (*Arch. Préhistorique*, p. 120).

It is not, however, proved that cranial amulets were exclusively derived from trepanned skulls, as there are some which show no trace of an old cicatrization or a falciform margin. These generally assume some regular form, as that of a triangle, an oval, or a circle, and they are sometimes perforated with one or two small holes for suspension (Plate I. figs. 4, 5, 6, and 7). One peculiarity, almost equally common to all classes of amulets, is the bevelled shape of their margin, a result which is almost invariably accomplished at the expense of the upper plate of the cranial bone (Plate I. figs. 1, 4, 7, and 22). The range of these cranial amulets,

both chronologically and geographically, corresponds very closely with that of skull trepanning as already described in these pages. Their prevalence in Gaulish cemeteries is attested by De Mortillet (*Revue d'Anthropologie*, 1876), Baron de Baye, and others (*Arch. Préhistorique*, pp. 188-9).

Amulets made of human bones, other than those of the skull, have been rarely met with. One supposed to be of this character is recorded from the Dolmen de Vauréal (Seine-et-Oise), and consists of the upper portion of a shoulder-blade in which there was inserted a small bronze ring for suspension (*Materiaux*, &c., vol. xii. p. 166). M. Quatrefages refers to one he had seen in the collection of Baron de Baye which was made of a long bone, probably a femur (*Hommes Fossiles et Hommes Sauvages*, p. 130).

On a previous occasion, when treating of the lake-dwellings of Europe, I drew special attention to the advanced state of the culture and civilisation which their remains indicated. A similar reflection is now suggested by the facts which I have just brought under your notice. It is impossible to suppose that the widely-scattered races inhabiting primeval Europe—a country then so inaccessible owing to its impenetrable forests and marshes, impassable mountains and great rivers—could have developed at so many independent centres a custom indicative of such a high order of speculative intelligence. It is, therefore, to the original home of neolithic civilisation, wherever that may be, that we must look for the origin of the custom of trepanning the human skull, and even there its antiquity would be probably lost in the long vista of preceding ages.

ILLUSTRATIONS ON PLATE I. EXPLAINED.

- Fig. 1. Amulet made of a portion of a human skull from a dolmen in Lozère, showing outer and inner surfaces. Half nat. size. Coll. Prunières. After Broca. *Congrès International*, p. 103, 1876.
- Fig. 2. Amulet made of a portion of a human skull from the dolmen of La Cave des Feés (Lozère), showing a groove for suspension. Half nat. size. Coll. Prunières. *Ibid.*, p. 104.
- Fig. 3. Portion of a human skull from the dolmen des Aiguières (Lozère), showing part of a large aperture due to trepanning. The part on the left shows a *post-mortem* section; that on the right an old cicatrized margin of a trepanned perforation. Half nat. size. Coll. Prunières. *Ibid.*, p. 148.

- Fig. 4. A perforated cranial amulet from Petit-Morin, showing both surfaces. Half nat. size. After Baron de Baye. *Arch. Préhistorique*, p. 159.
- Figs. 5, 6, 7. Cranial amulets from Petit-Morin. Half nat. size. *Ibid.*, p. 160-2.
- Fig. 8. Skull from the Cavern de l'Homme-Mort (Lozere). Quarter nat. size. Coll. Prunières. After Broca. *Congrès International*, p. 149, 1876. The portion of the aperture AB has been trepanned during life, the rest after death.
- Figs. 9, 10. Two trepanned skulls from Petit-Morin. After Baron de Baye. *Arch. Préhistorique*, pp. 164, 167.
- Fig. 11. Trepanned skull from a Frankish grave near St Quentin. *Materiaux, &c.*, vol. xxi. p. 272.
- Fig. 12. Trepanned skull from Limet, Belgium. After De Nadaillac. *Acad. des Inscrip. et Belles-Lettres, Comptes Rendus*, 1886.
- Fig. 13. Skull from Casa da Moura (Portugal), showing the commencement of trepanning. After Cartailhac. *Agés Préhist. de l'Espagne, &c.*, p. 84.
- Fig. 14. A trepanned skull from an Inca Cemetery in Peru. After Squier. *Incidents of Travel and Exploration in the Land of the Incas*, p. 457.
- Fig. 15. Trepanned skull from a dolmen called Cibournios, showing a large aperture, partly (AB) the remains of the cicatrized margin of an old perforation. Quarter nat. size. Coll. Prunières. After Broca. *Congrès International* p. 136, 1876.
- Fig. 16. Portion of a skull showing a scraped depression across the lambdoidal suture (right side). Half nat. size. *Ibid.*, 177.
- Fig. 17. Human skull from the *Allée Couverte de Dampont*, showing a posthumous trepanning along the margins of the frontal and temporal bone. Quarter nat. size. After Ad. de Mortillet. *Bull. de la Soc. d'Anthrop.*, 2nd May 1889.
- Figs. 18, 20. Irregularly shaped cranial amulets, showing portions of a falciform and cicatrized edge of a previous perforation. Half nat. size. After Broca. *Congrès International*, p. 155, 1876.
- Fig. 19. Cranial amulet, partially prepared for suspension. Half nat. size. Coll. Prunières. *Ibid.*, p. 160.
- Fig. 21. Fragment of a parietal bone from the rock-shelter of *Entre-Roches*. Quarter nat. size. *Ibid.*, p. 165.
- Fig. 22. Cranial amulet found inside the trepanned skull from the dolmen *Cibournios* (fig. 15), showing a falciform and cicatrized portion of its margin, the rest being highly bevelled except a small part that appeared to have been broken off. Half nat. size. *Ibid.*, p. 150.