

DEPARTMENT OF THE INTERIOR  
U. S. GEOGRAPHICAL AND GEOLOGICAL SURVEY OF THE ROCKY MOUNTAIN REGION  
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ON  
  
PREHISTORIC TREPHINING  
  
AND  
  
CRANIAL AMULETS

BY  
  
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ACT. ASST. SURGEON U. S. ARMY



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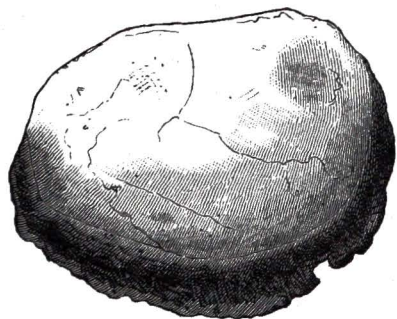


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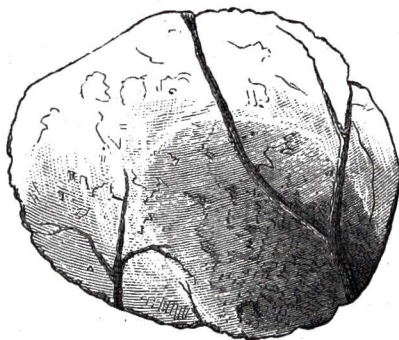


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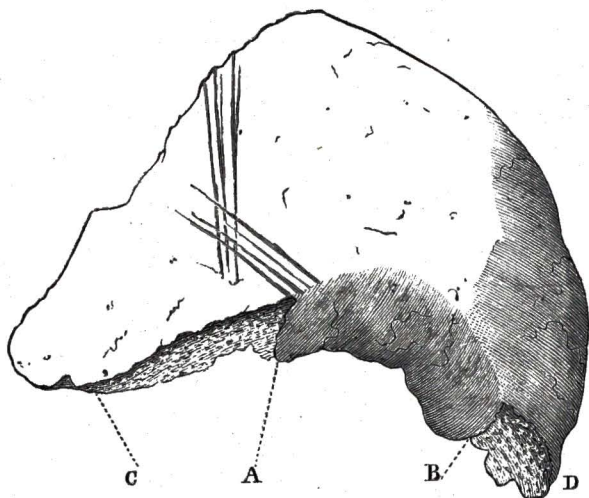


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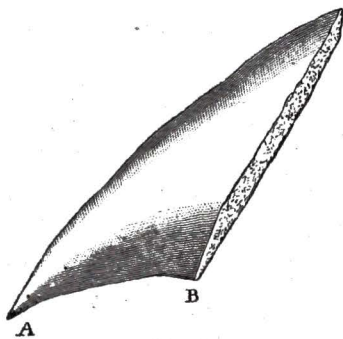


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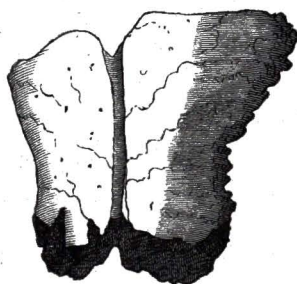


FIG. 5.

FIGS. 1 and 2. The rondelle of Lyons. FIG. 3. An amulet from La Lozère: A-B, the cicatrized edge from surgical trephining; A-C, B-D, post-mortem sections. FIG. 4. A-B, cicatrized edge. FIG. 5. Amulet with groove for suspension. All natural size. (Broca.)

## ON PREHISTORIC TREPHINING AND CRANIAL AMULETS.

BY ROBERT FLETCHER.

Since the publication of Professor Broca's interesting article on Cranial Amulets and Prehistoric Trephining, in 1877,<sup>1</sup> no connected account has been attempted, so far as the writer knows, of the additional discoveries which have been reported. These are scattered through the journals on anthropology, and it would seem that a review of the whole subject, commencing with a summary of Broca's observations and arguments, and bringing together subsequent discoveries, would not only be of interest in itself, but might result in more careful observation, leading perhaps to discoveries of a similar custom in America.

The first communication upon the subject of cranial amulets, and which led to the discovery of evidence of prehistoric trephining, was made in August, 1873, by M. Prunières, at the meeting, at Lyons, of the French Association for the Advancement of Science.<sup>2</sup> M. Prunières is well known for his researches in connection with the dolmens of La Lozère. He exhibited to the association a piece of bone of an ovoid shape, 50 millimeters by 38 in its two diameters. (See Plate I, figs. 1 and 2.) The two faces were untouched, but the edges had been beveled and most carefully polished. It was discovered in the interior of a skull the entire side of which had been cut away, but it was not a part of this skull; the difference

<sup>1</sup> Sur la trépanation du crâne, et les amulettes crâniennes à l'époque néolithique, par Paul Broca. Paris, 1877, 8°. *Also*, Rev. d'anthrop., Paris, 1877, vi, 1-42; 193-225. *Also*, Congrès d'anthrop. et d'archéol. préhist., Budapest, 1876, 101-192.

<sup>2</sup> Assoc. française pour l'avancement des sciences. Compte rendu de la 2<sup>me</sup> sess., Lyon, 1873, Paris, 1874. 8°, p. 703.



in color, thickness, and density of structure showing, beyond a doubt, that it had formed part of another cranium.

At various times similar pieces of bone were discovered, in some of which holes had been drilled or grooves cut, as if for the purpose of suspending the fragments from the person. The name of "rondelles" has generally been applied to these fragments, although some archæologists, accepting the theory of M. Prunières, have termed them *amulets*. (Plate I, figs. 3, 4, and 5.)

The use of amulets, as is well known, comes down from the very earliest period, and M. Prunières was of opinion that the extreme care bestowed in polishing these fragments, together with the fact that no other purpose could be divined for them, was sufficient evidence as to the use for which they were intended. The latter reason, it must be admitted, is not strikingly convincing.

As early as 1868, M. Prunières discovered, in a large dolmen near Aigüières, a skull of which a large part of the side had been removed. This operation had evidently been effected by a cutting or sawing process, although one portion of the edge appeared smooth and polished. Many "rondelles" were discovered in the same spot, and M. Prunières formed the theory that they were pieces removed in converting a skull into a drinking cup. To drink from the skull of a dead enemy was a refined enjoyment not exclusively practiced in the Walhalla of the Norsemen. Livy tells us that the Gauls celebrated their victories in that manner,<sup>3</sup> and M. Prunières supposed that the skull and fragments which he had unearthed were relics of a similar custom. He made known his views to the Paris Society of Anthropology in 1874,<sup>4</sup> accompanying his communication with specimens of perforated skulls and rondelles.

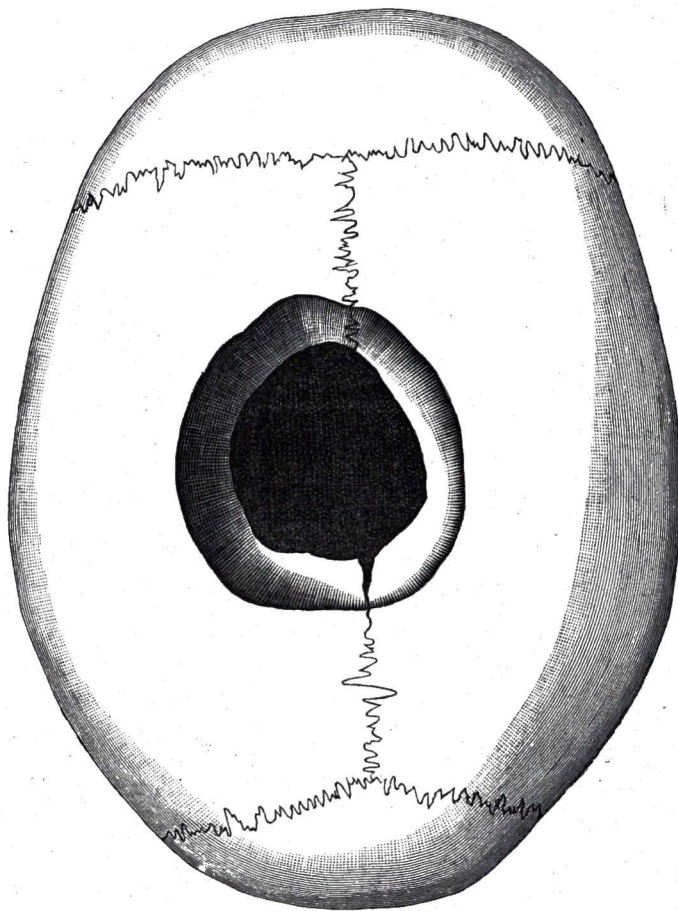
These pieces were examined by Professor Broca, who at once observed that the smooth or polished condition of parts of the edges of the rondelles

<sup>3</sup> A cup made from a human skull was exhumed by Mr. E. R. Quick, in 1880, from an aboriginal cemetery near Brookville, Franklin County, Indiana. From its size, and from the distinctness of the sutures, it was evidently the skull of a young person. The base had been removed, and both the inside and outside had been scraped, as the scratches on the bone indicated. Two small holes had been drilled at one spot near the edge, evidently for the insertion of tendons or strings to check an incipient crack, just as the modern housewife saves a bowl or teacup. *Journal Cincinnati Soc. Nat. Hist.*, 1880-'81, iii, 296. Plate of same in vol. iv, p. 257.

<sup>4</sup> *Bull. Soc. d'anthrop. de Paris*, 1874, 2<sup>me</sup> sér., ix, 185-205.







Cranium from the cavern of L'Homme-Mort (La Lozère). Surgical trephining has been performed upon the sagittal suture. Two-thirds natural size. (Prunières.)

and of the sections of the skull was due, not to artificial polishing, but to a process of natural cicatrization, which must necessarily have taken place during life, and, indeed, many years before death. (Plate II.)

After examination of a great many other specimens, Broca finally announced two conclusions as the result of his investigations:

I. In the neolithic age, a surgical operation was sometimes performed for the cure of certain internal maladies, which consisted in making an opening in the skull. This was almost, if not quite, exclusively practiced on young children, and is to be termed *prehistoric surgical trephining*.

II. The skulls of those who survived this operation were supposed to possess some remarkable qualities, and when the owners died, amulets or rondelles, consisting of portions of the skull, were carefully cut out. By preference, the portion should contain a segment of the original aperture. This was *posthumous trephining*.<sup>5</sup>

A concise account must be given of the evidence upon which these conclusions were based.

To the practiced eye there is no difficulty whatever in distinguishing between a section of bone which has not been followed by any reparative process and one in which that process has gone on to completion. In the first case, the edges are sharp, the cells of the diploë are open, and the action of the cutting instrument is seen in the successive cuts by which the operation has been performed. It is not uncommon to find scratches on the surface of the bone, indicating where the tool had slipped away from the intended incision. (Plate I, fig. 3.)

When cicatrization of a trephined or fractured skull has been perfected, the edges present a rounded, ivory-like surface, due to the new osseous tissue deposited in the cells of the diploë and upon the edges of the outer and inner tables.

But while it is easy to discriminate between a post-mortem incision and one long since healed, it would be very difficult to decide that the incision might not have been made during life, but shortly before death. The process of repair in bone is much slower than in softer tissues, and it has been suggested that the cases of so-called posthumous trephining were really

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<sup>5</sup> Sur la trépanation du crâne, etc., p. 9.



cases in which the operation had resulted fatally in a very short time, and before any process of repair had commenced. To this it may be replied that no examples have hitherto been found of skulls or rondelles where the section was *in process* of cicatrization; all are either entirely fresh, or long since healed.<sup>6</sup> It would be unreasonable to suppose that these operations were entirely successful or else immediately fatal. The operation, in itself, is not very dangerous to life, as has been shown by many experiments on animals. Its mortality as a surgical measure, in cases of fracture of the skull, is due to the serious injury to the brain for which it becomes necessary to employ it.

A more convincing reply is that, in the greater number of the trephined skulls in question, *the two sections coexist*; a portion exhibiting the rounded, ivory surface of ancient cicatrization, the rest of the section being absolutely fresh. (See Plates I, V, and VI.)

The suggestion that these apertures were the result of blows from weapons must be at once dismissed. No weapon of that day, or this, could produce such openings with their well-defined, beveled edges. The blows of stone hammers or axes resulted generally in necrosis, or death of the bone, and often in disruption or bulging of the inner table of the skull for some distance from the seat of injury. Some excellent examples of the consequences of such formidable injuries are to be seen in an article by Dr. F. W. Langdon, describing the crania in a prehistoric cemetery at Madisonville, Ohio.<sup>7</sup> The accompanying plate (Plate III), copied by Dr. Langdon's permission, well illustrates the striking difference between the results of blows followed by necrosis of the bone, and the condition succeeding the operation of trephining.

The apertures made by the so-called surgical trephining do not differ greatly in size; they are nearly always elliptical, seldom round, and extend from 35 to 50 millimeters in length, by 6 to 10 millimeters in breadth. The edges are very oblique, at the expense of the outer table of the skull. The operation appears to have been performed upon all parts of the head,

<sup>6</sup>Some more recent discoveries, however, which will be referred to later, show that this assertion of Broca's was rather too sweeping.

<sup>7</sup>The Madisonville prehistoric cemetery; anthropological notes. By F. W. Langdon, M. D. *Journal of the Cincinnati Soc. Nat. Hist.*, iv, Oct., 1881, 250-253.

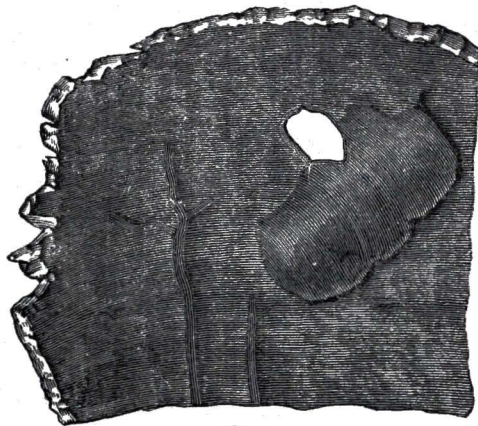


FIG. 1.

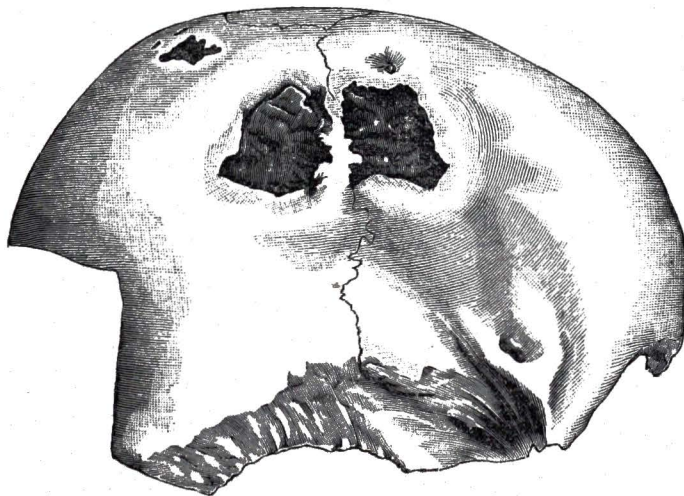


FIG. 2.

FIG. 1. Perforating fracture of the left parietal near its posterior superior angle; internal view showing the depressed fragment of the internal table which has reunited. FIG. 2. Result of injury to right frontal and parietal region, causing extensive sinuses between the inner and outer table. Natural size. (Langdon.)





excepting the forehead, but in the greater number of instances one of the parietal bones has been the chosen site. There is a very interesting skull in the Musée Broca [crâne de Vauréal (Oise)], which, in addition to a large depression in the frontal bone, presents a remarkable instance of trephining on the occipital, two-thirds of that bone having disappeared. Part of this opening is due to the surgical operation, the elliptical edges, about half of the original aperture, exhibiting the characteristic ivory-like surface of cicatrization, while the remainder has been removed by post-mortem trephining.<sup>8</sup>

In no instance has an artificial opening been observed excepting where the bone was covered by the hairy scalp, and that the purpose was to avoid noticeable disfigurement seems a justifiable conclusion. It is also another argument against possible origin from wounds in battle, as in such cases the forehead was the part most liable to be injured.

Broca states that the operation must have been performed just as frequently on the female as on the male.

It is necessary to inquire what other causes may account for abnormal cranial apertures.

I. There are congenital deficiencies. These are generally found in the parietal bones, and are nearly always symmetrical, being found in both bones. A single congenital aperture has been sometimes observed through which hernia of the brain and meninges has taken place. In such cases the edges are everted and show a more or less diseased condition.

II. Disease of the bone may produce openings which may afterwards become cicatrized, and thus resemble the apertures in question; but disease of the bone always extends beyond the limits of the perforation produced, and leaves indelible traces. A close examination of these trephined neolithic skulls shows a perfectly sound condition of the bone in the vicinity of the aperture in all cases.<sup>9</sup>

III. Traumatic sources have been already discussed and dismissed. Even the cavalry saber of to-day could not produce such results. It does

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<sup>8</sup>Lésions osseuses de l'homme préhistorique en France et en Algérie, par Jules Le Baron. Paris, 1881, 4<sup>o</sup> (thèse), p. 47.

<sup>9</sup>In this Broca was mistaken. A very remarkable instance of trephining in connection with disease of the bones of the cranium was communicated to the Société d'anthropologie by M. Parrot, in 1881. A description of the relic will be found farther on.

occasionally cut off a slice of the cranium, but it certainly could not cut out rondelles from the parietal bones. (See Plate IV.)

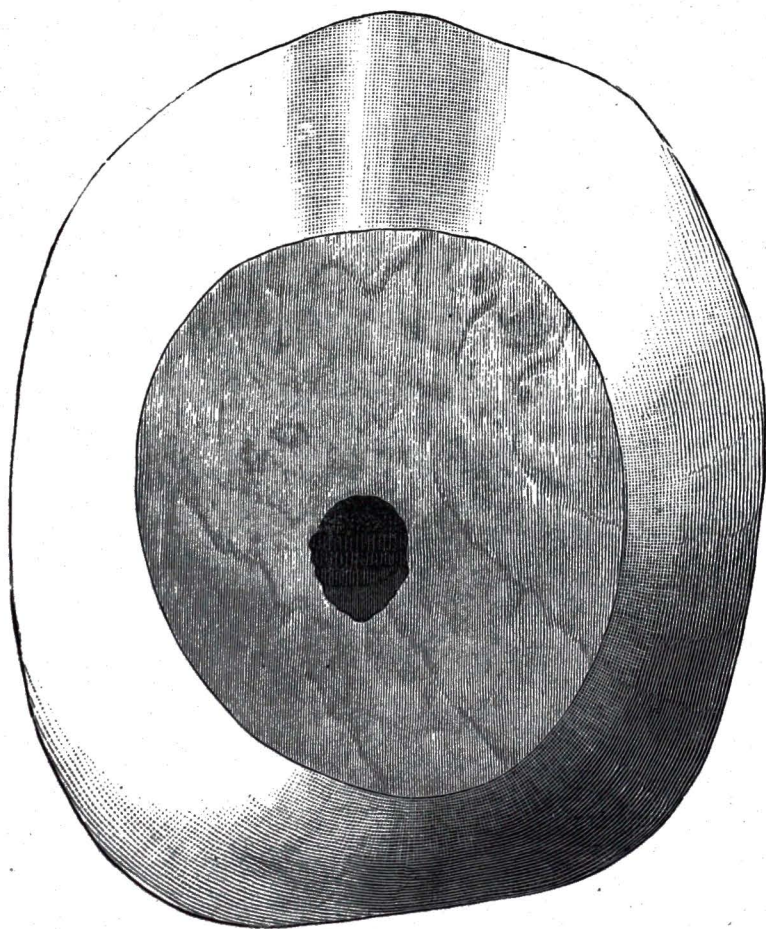
Contused wounds, such as would be produced by rude weapons, produce necrosis or death of the bone, and where healing takes place irregular apertures remain, entirely unlike the result of a surgical operation.

The reparative process in wounds of the cranium in the adult is one of extreme slowness. An osteitis, or inflammation of the bone, is set up, which extends to some distance from the edges of the wound. The vascular canaliculi of the two tables become dilated, and it is often years before they recover their normal caliber. But in the skulls under discussion, in all instances, the edges of the aperture made by surgical trephining exhibit the most perfect readjustment of the parts. This is the case in young as well as in old crania; in one instance particularly, that of a woman of less than twenty-five years of age, the wisdom teeth being still in process of development, the traces of the traumatic inflammation have as completely disappeared as in the skulls of very old persons. This led Broca to believe that the operation must have been performed at a very early age, and other observations tend to confirm that theory. Although the operation of trephining, as before stated, is not a very dangerous one when uncomplicated by injury to the brain, yet it would be unreasonable to suppose that it was never fatal. If sometimes fatal, we should expect to find skulls exhibiting the evidence of partial recuperative process. But, with one exception, no such relics have been discovered; the edges of the openings are either absolutely fresh, indicating post-mortem work, or absolutely cicatrized, indicating that the operation had been performed many years before the death of the subject. What then became of the failures?

If the operation was performed only on young children, then the rapid decay of their tender bones would answer the question. In dolmens containing a large number of adult crania, it is usual to find nothing but mere débris of the bones of children, and in the case of trephined skulls, the thin edges of the apertures would offer favorable points for the chemical and physical agency of erosion.

It is unnecessary to relate all the observations and arguments which led Broca to the conclusion that prehistoric trephining was performed mainly,

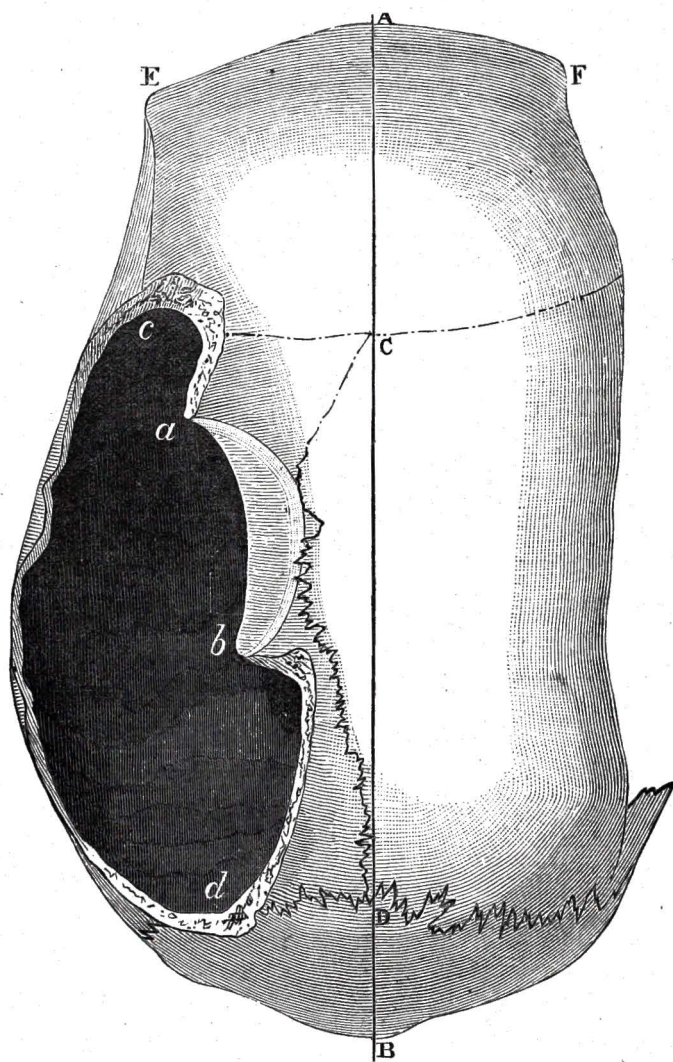




Loss of substance from the vertex of a skull produced by the stroke of a Tartar saber. Natural size. (Musée Broca.)







Cranium from Cibournies. A-B, median line; E, left external orbital apophysis; F, right external orbital apophysis, broken. *a-b*, the cicatrized edge of surgical trephining; *a-c*, *b-d*, post-mortem sections. The sagittal suture, instead of following the line C-D, has been driven over to the left. Two-thirds natural size. (Broca.)



if not entirely, upon the young child, but one especially striking and ingenious illustration which he founded upon a cranium discovered by Prunières in the dolmen of Cibournios must be related.

It is well known that the sutures of the skull tend to become firmly united with the advance of years. In the young child the remains of the sutural membrane still exist, and a separation is easy. In the accompanying drawing it will be perceived that the left parietal bone has been operated upon, and the resistance of the arch on that side being thereby diminished, the right parietal has encroached considerably over the median line, in the process of after growth, indicating the youth of the subject at the time of the operation. (Plate V.)

As regards the general harmlessness of the operation, there is a view which must be suggested, in passing, which has not been considered before in this connection, and that is the relation of race to traumatism. In other words, the capacity to bear wounds or surgical operations, or the contrary, dependent not on individual but on race characteristics. Long ago, Velpeau said that French flesh and English flesh were quite different, and operations that were generally successful in the one were frequently fatal in the other. The subject is of immense extent, requiring copious observations, which should include toleration of child-bearing, before any conclusions can be reached. It will be seen presently that the Arab tribes who practice trephining regard it as almost without danger. It is possible that race is to be regarded as a factor in the calculation of the results of trephining.

Some account must now be given of the probable manner of proceeding in prehistoric trephining.

There are three processes by which an opening in the cranium can be methodically produced—by rotatory movement, by cutting, and by scraping.

The most perfect example of the first-named method is in the use of the modern trephine, which consists of a steel cylinder with saw-teeth and a central pin to guide its first motion; the whole being worked by a cross-handle like that of a gimlet. This instrument cuts out a circular piece of bone, leaving a corresponding aperture with perpendicular edges. The first form of the trephine dates back to the early days of Greek surgery; cer-

tainly to more than 500 years before the Christian era. While, of course, no instrument of this kind could have been known in the neolithic age, yet an opening by terebration could have been obtained with any pointed tool. M. Prunières says that the shepherds of La Lozère practice it to this day, to relieve sheep of the "staggers." The head of the animal is held between the knees of the operator who fixes the point of his large sheath-knife in the skull, and by rotation of the handle between his hands a hole is speedily produced. A similar practice prevails in Germany, according to Veckenstedt, the operation being performed by the shepherds in order to "burst a bladder in the inside of the head of the sheep." But all such openings are necessarily round, with nearly perpendicular edges, while the surgical trephining of prehistoric times is characterized by elliptical openings and by obliquely beveled edges.

As regards the second method, by cutting, no doubt flint saws might have been employed for the purpose, but it would have been impossible to produce the even ellipsis, with its broad bevel, in such a manner. A polygonal-shaped aperture could only have resulted.

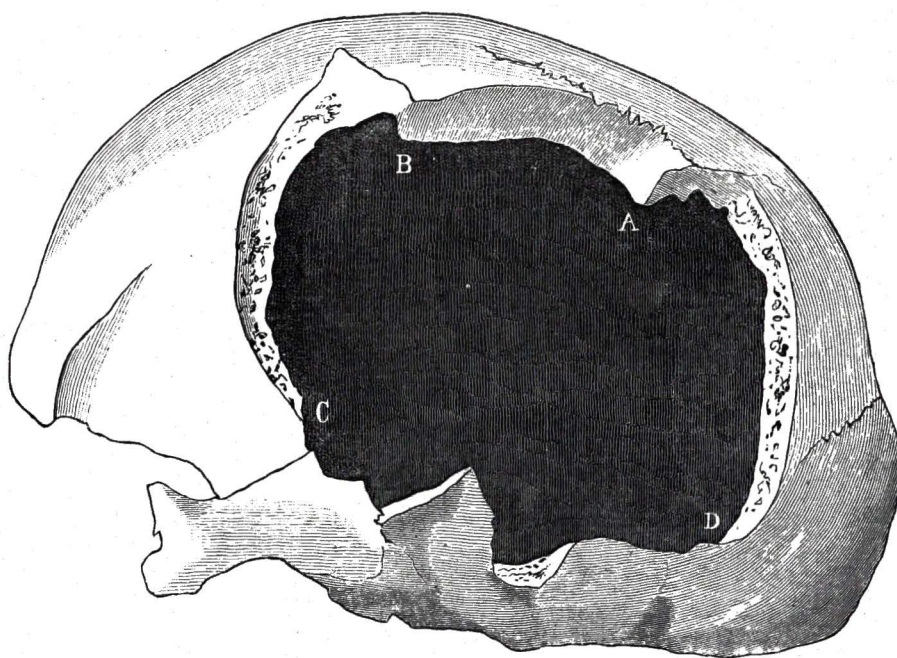
There remains the process by scraping. In some of the South Sea Islands trephining is practiced in this manner, and, indeed, the exfoliative trepan of modern surgery provides for a similar process. Broca presented to the Society of Anthropology of Paris, in 1876, some skulls upon which he had himself produced precise counterparts of neolithic trephining by scraping with a piece of broken glass.<sup>10</sup> The apertures were elliptical, the long axis being in the direction of the to-and-fro motion of the scraper, and the edges were broadly beveled. It might seem, at first, that this must have been a very slow and barbarous operation, but when it is remembered that the evidence points strongly to the belief that trephining was practiced upon the very young, the objection, to a great extent, disappears. It took Broca nearly an hour to produce the opening in a hard adult cranium, but in a child's skull it required but four minutes to attain the same result. Again, in July, 1877, Broca presented to the same society the skull of a two months' old puppy, upon which he had performed the operation of trephining with a piece of flint from Cro Magnon, and, although the flint was

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<sup>10</sup> Bull. Soc. d'anthrop. de Paris, 1876, 2<sup>me</sup> sér., xi, 512.







Cranium from Cibournios. A-B, cicatrized edge from surgical trephining. B-C, A-D, post-mortem sections. Two-thirds natural size. (Broca.)

very blunt and the bone twice as thick as that of a child of six years of age, the operation was completed in eight minutes; the dog recovered rapidly without any symptom of fever.<sup>11</sup>

It is a curious fact that the amulets or rondelles, in the great majority of instances, have been cut from skulls which had undergone, and a long time survived, surgical trephining. Many of these skulls exhibit immense openings, unmistakably of post-mortem workmanship, but with a fragment of the original cicatrized edge of the surgical operation remaining. (See Plates V and VI.)

Many crania have been discovered with the characteristic opening indicating surgical trephining long since cicatrized, but which had been subjected to no post-mortem operation. Why these exceptions should occur it is impossible to discover. Possibly they were due to the law of demand and supply, and the amulets not being wanted at the time, the skulls were left undefaced.

Quite a large number of these so-called amulets or rondelles have been discovered, and are to be seen in the museums of Europe.<sup>12</sup> Some of them are very regular in outline, and very considerable labor has been bestowed upon them to produce a polished surface and rounded edges. The rondelle discovered by Professor Prunières in the interior of a skull, and which first drew attention to the subject, is highly polished and beveled at the expense of the outer table. (Plate I, fig. 1.) These carefully prepared amulets have a very different appearance from the fragments of cranial bone which are found in ancient burial places. The latter are more or less discolored and eroded by the moisture and mineral ingredients of the soil in which they have rested. The rondelles, on the other hand, have a dry, hard surface, and are almost of the color of old ivory. This is probably due to their having been worn as ornaments or amulets for a very long time; perhaps by many successive owners. Other amulets are of irregular shape, being elliptical, trapezoid, or triangular. Some amulets have been found with a

<sup>11</sup> Bull. Soc. d'anthrop. de Paris, 1877, 2me sér., xii, 400; 477.

<sup>12</sup> Prunières. Sur les crânes perforés et les rondelles crâniennes de l'époque néolithique. Assoc. française pour l'avancement des sciences. Compte rendu, 3<sup>me</sup> sess., Lille (1874), Paris, 1875, 597-637. —. La crémation dans les dolmens de La Lozère. Nouvelles rondelles crâniennes. Dolmens de la Marconière et tombelle de Boujoussac. *Ibid.*, 6<sup>me</sup> sess., Le Havre (1877), Paris, 1878, 675.



groove cut around them, apparently for the purpose of suspending them from the neck. (Plate I, Fig. 5.)

It now remains to give some account of Broca's theory as to the purpose of this surgical and post-mortem trephining. He rejected the theory that the surgical operation in early life was performed on account of fracture or disease of the bone, nothing whatever in the relics seeming to indicate such conditions. He was, at one time, disposed to think that the operation had a religious or superstitious motive, and that it indicated initiation into some sacred order; but the extent of the discoveries of trephined skulls, and the fact that women as well as men were subjected to the operation, obliged him to give up that view. His conclusion was that, in all probability, the operation was performed as a cure for convulsions, simple or epileptic.

Trephining as a curative treatment for epilepsy has been practiced somewhat extensively in our own day, but it is now entirely abandoned, except in cases of traumatic epilepsy, when the manifestation of the disorder has been coincident with an injury to the skull. In such cases, removal of depressed fragments of bone is clearly indicated, and has, in many instances, been followed by entire disappearance of the epileptic fits.

In the curious storehouse of absurdities which our ancient *Materia Medica* exhibits, powdered bone from the human skull, as well as powdered mummy, figure as unfailing remedies for epilepsy. Sometimes the bone was to be calcined, and the supplementary ossicles of the skull, known as *ossa Wormiana*, were in high repute for this purpose. In old works the title of *os antiepilepticum* was an ordinary name for a Wormian bone.

For many ages epileptics were believed to be possessed of devils and to be fit subjects for exorcism. When, in obedience to spell or potent command, the evil spirit left the sufferer, or, in other words, when the fit was over, it was through the open mouth that the exit was made. There is a cut in a curious old German block-book representing the well-known incident of the epileptic of the New Testament. The mouth of the man is painfully distended, and the horned head of a small imp is visible emerging from his throat. The herd of swine, unconscious of the impending catastrophe, are watching the proceeding. It is not difficult to imagine how appropriate it would appear to make an opening in the skull for the escape

of an evil spirit which could not be dislodged by ordinary exorcism.<sup>13</sup> It is for this purpose, among others, that trephining is practiced to this day among the South Sea Islanders and by some of the Arab tribes of Algeria.

From these and similar considerations Broca was led to believe that prehistoric trephining was practiced for the relief of convulsions in infancy or childhood, and that a fragment of the skull of a person who had undergone this operation was worn as a preventive of the like common and alarming disorder. Hence the care with which a portion, at least, of the cicatrized border was preserved in the piece cut out to form the amulet.

It must be borne in mind that a primitive people would not be likely to discern any difference, except of degree, between the ordinary convulsions of childhood and epileptic fits. The former, though alarming in appearance, are by no means generally dangerous, and we can easily understand that the surgical operation would, in such cases, be credited with the cure. It is thought, even in our own enlightened day, that the *post quod* is occasionally taken for the *propter quod*, in surgical as well as medical therapeutics.

So far, it may be said that Broca made a fair case in favor of his theory, but he carried his theorizing still further. He was of opinion that these trephined skulls and corresponding amulets indicated that a belief in a future existence obtained among these primitive races. His argument is based upon the discovery of amulets in the interior of trephined crania. "Why," he asks, "was this precious relic placed inside the skull at burial? Was it not a talisman to preserve the defunct, in a future existence, against the evil spirits that had afflicted him in early life? If so, does it not show that a future existence was anticipated?"

When it is remembered that only three cases have been observed in

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<sup>13</sup> A curious custom is related by Miss A. W. Buckland, which may possibly be due to some legendary trace of the belief in the efficacy of trephining as a remedy for fits. She observed at Cannes, in the south of France, a number of dogs with oblong patches of red leather stuck on their heads, and upon inquiry was informed that these dogs were *subject to fits*, and that the red leather was worn as a means of prevention. Jour. Anthropol. Inst. London, 1881, xi, 16.

This part of the subject must not be dismissed without an allusion to the story of the birth of Athene, so inimitably told by Lucian. It will be remembered that Zeus, suffering from intolerable pain in the head, called upon Hephæstus to split open his head with an axe. The latter unwillingly obeyed, when from the fractured opening sprang out the Goddess of Wisdom, clad in bright armor and with spear in hand. This is probably the first recorded instance of historic trephining.



which rondelles were discovered in the interior of skulls, it must be admitted that this amiable theory rests upon a very slender foundation. It seems much more probable that their presence in the locality in which they were found was due to accidental causes, such as the pressure of roots, or the movements of worms. Mortillet and Prunières both mention finding small bones of the hand or foot inside of crania.

As regards the extent and range of the relics indicating this singular custom, it may be said that, in France, the department of La Lozère has produced the greatest number. This, however, is probably due to the vigorous researches of Prunières and others in that region. Throughout the south and southeast of France discoveries of trephined skulls continue to be made. Broca states that the custom certainly prevailed throughout the entire neolithic or polished stone period, as trephined skulls have been found in the cavern of L'Homme-Mort, in La Lozère, which belongs to the earliest part of that age, and in the grottoes of Baye, belonging to its close. While it is not surprising that no trace of the custom should have been discovered in the relics of the palæolithic or mesolithic ages, it is certainly remarkable that it should have disappeared with the neolithic age so completely. It is perhaps not too much to say that no authentic instance of the discovery of a trephined skull from the bronze period is on record. Doubtless the rapidly increasing custom of incineration of bodies must be regarded as a principal cause. M. de Baye has found cranial amulets in tombs of a later epoch, and infers that the custom of trephining still prevailed.<sup>14</sup> This does not, however, follow, as the amulets may have been preserved through many generations.

At the meeting of the International Congress of Prehistoric Anthropology held at Brussels, in 1872, Dr. G. A. Lagneau read a paper entitled, "Sur les crânes de Furfooz"; and in the discussion which followed the measurements of some Esthonian crania were given by M. Quatrefages. In the plate<sup>15</sup> illustrating the latter, one skull has an aperture about the center of the coronal suture which strikingly resembles the beveled edges pro-

<sup>14</sup> Bull. Soc. d'anthrop. de Paris, 1876, 2<sup>me</sup> sér., xi, 121.

<sup>15</sup> Congrès international d'anthropologie et d'archéologie préhistoriques. Compte rendu, 6<sup>me</sup> session, tenue à Bruxelles en 1872, Bruxelles, 1873, 558.

duced by trephining. No allusion was made to it, the subject at that time not having been brought to light.

As early as 1875 a trephined skull was found in a tumulus at Bougon, near Niort, in the south of France, which was described by M. Babert de Juillé. In his specimen, the openings had been made near the top of the skull, and the edges were perfectly cicatrized.<sup>16</sup>

At the meeting of the Association for the Advancement of Science held at Nantes, M. Chauvet presented a cranial amulet found in a tumulus in the forest of Boixe.<sup>17</sup>

In the tertre Guérin, on the right bank of the Seine, not far from Paris, M. Chouquet found the skull of an old man, with a trephined aperture which had been long completely cicatrized.<sup>18</sup> M. Chouquet also discovered some specimens of both surgical and posthumous trephining in a mound, near Écuellen, which contained incinerated bones. He was disposed to think that these relics belonged to the bronze age.<sup>19</sup>

In 1877 M. Prunières presented to the Paris society two admirable specimens, in one of which the aperture, thoroughly cicatrized, was in the occipital bone, a little to the right of the median line—an unusual position.<sup>20</sup>

M. Gassies discovered a trephined skull at Entre Roche, near Bordeaux, in a burial place which he thought to be palæolithic. Further researches, however, by M. Chauvet, assigned it to the neolithic period, a polished stone axe and similar relics having been discovered there.<sup>21</sup> Some other doubtful cases of trephined skulls from the palæolithic period have been announced, but no well-authenticated specimens have been discovered which are of earlier date than the polished stone age.

An interesting specimen was presented to the Paris society, in 1878, by M. Guégan.<sup>22</sup> It was found in a dolmen at Étang-la-Ville, and exhibited

<sup>16</sup> Rapport de la commission des tumuli de Bougon, suivi d'une étude sur la trépanation préhistorique, et en particulier sur le crâne trépané que possède la musée de Niort. Par Babert de Juillé. Niort, 1875. 8°.

<sup>17</sup> Assoc. française pour l'avancement des sciences. Compte rendu de la 4<sup>me</sup> sess., Nantes, 1875, Paris, 1876, 854.

<sup>18</sup> Bull. Soc. d'anthrop. de Paris, 1877, 2<sup>me</sup> sér., xii, 13-16.

<sup>19</sup> *Ibid.*, 1876, 2<sup>me</sup> sér., xi, 279.

<sup>20</sup> *Ibid.*, 551.

<sup>21</sup> *Ibid.*, 1877, 2<sup>me</sup> sér., xii, 12.

<sup>22</sup> *Ibid.*, 1878, 3<sup>me</sup> sér., i, 198.



incomplete trephining by *raclage*, or scraping. This modification of the process of trephining consisted in removing the outer table of the skull by scraping, leaving the inner or vitreous table intact. Altogether some twenty specimens of the kind have been collected. What the object was of this incomplete operation it is difficult to divine. Possibly the malady was relieved and the further process rendered unnecessary.

In 1603 there was published in Lyons a book which is now excessively rare. Its title was: *Traicté de l'épilepsie, maladie vulgairement appelée au pays de Provence, la goutette aux petits enfants*. Par Jehan Taxil. 8°. The writer evidently confounded convulsions with epilepsy, the latter disease not attacking little children, rarely, indeed, developing itself before the tenth year. The remedy he prescribes is scraping away a portion of the outer table of the skull. Sometimes the inner table, also, was removed by the exfoliative trepan. This reproduction of a prehistoric usage may perhaps be cited as a curious instance of atavism in surgery.

In 1878 M. Prunières made some extensive researches in the caverns of Beaumes-Chaudes (La Lozère), and found more than sixty specimens of trephined skulls and cranial amulets. In three of these there was evidence of the operation having been twice performed on the same subject.<sup>23</sup>

In 1880 M. Mauvoisin found in some artificial grottoes near Baye several crania of the neolithic age, of which two exhibited cicatrized openings. Upon one of them post-mortem sections had been made in the usual manner.<sup>24</sup>

A recent and very interesting contribution to our knowledge of the subject is to be found in a paper read before the Paris Society of Anthropology by M. Parrot.<sup>25</sup> It describes a cranium found in a grotto of the neolithic period at Bray-sur-Seine (Marne). The frontal and both parietal bones exhibit the consequences of extensive disease. Depressions exist, such as would be produced, M. Parrot says, by pressing the thumb into soft putty. On the left parietal a small island of undiseased bone stands up in the center of the depressed portion, forming a strong contrast. The bone

<sup>23</sup>Bull. Soc. d'anthrop. de Paris, 1878, 3<sup>me</sup> sér., i, 211.

<sup>24</sup>*Ibid.*, 1880, 3<sup>me</sup> sér., iii, 10.

<sup>25</sup>Crâne trouvé dans une grotte de l'époque de la pierre polie à Bray-sur-Seine (Marne), avec une quarantaine de squelettes, haches polies, poinçons en os, colliers et ornements en coquilles. *Ibid.*, 1881, 3<sup>me</sup> sér., iv, 104-108.



which has been subjected to disease is excessively thin, and was broken in two or three places in the process of extraction. No trace was left of the coronal suture, the disease having entirely obliterated it. But the most interesting feature was the evidence that surgical trephining had been performed, apparently for the relief of the disease. The opening made involved the frontal and left parietal bones; it was of the usual oval shape, but its size could not be exactly ascertained, as the posterior portion of it was lost in a large, irregular hole, produced, no doubt, when the skull was removed from the earth. The trephining was performed partly on sound and partly on the diseased bone, and the edges of the aperture (what remains of them) are perfectly cicatrized, so that it is evident that the patient long survived the operation. It cannot be held that the disease was the result of the operation. In the large number of trephined skulls which have been examined there is no instance of disease of the bone, and in this particular case, as M. Parrot observes, if the disease had resulted from the operation it would have spread all around the opening, which is not the case, as what remains of the aperture is in sound bone.

The disease, which was probably an exfoliative osteitis or inflammation of the bone, was, M. Parrot thinks, of traumatic origin. There is a depression on the frontal bone which may have been caused by a hatchet-stroke. Whether the operation was performed to arrest the disease, or to remove some of its symptoms, is, of course, a matter of conjecture; but as the diseased bone and the edges of the aperture had all become firmly cicatrized, it is certain that the patient lived for some years after.

M. Parrot dwells upon the importance of this discovery as proving that trephining was employed as a therapeutic measure in disease, and not only for the relief of imaginary causes of evil, as in convulsions or epilepsy. It is possible, however, that the subjective symptoms attending such extensive disease of the cranium may have required the usual remedy for eviction of the supposed malignant spirit.

In Germany a few examples have been met with of prehistoric trephining. Prof. H. Wankel discovered in the grotto of Bytchiskala, in Bohemia, the skeleton of a girl of about twelve years of age. The skull bore unmistakable evidence of surgical trephining having been performed during life.

The aperture was on the right side of the frontal bone, was nearly circular in shape, and about 3 centimeters in diameter. The inner table of the skull exhibited no trace whatever of inflammatory process, such as would inevitably have accompanied caries or exostosis of the bone. At great length Professor Wankel examines every possible disease or injury of the bone which might be supposed to account for the opening, and rejects them all. From this argument by exclusion he arrives at a very firm belief that the case was one of surgical trephining, precisely analogous to those observed in the crania of La Lozère.<sup>26</sup>

About the same time Dr. B. Dudik sent a communication to the Berlin Ethnological Society, announcing his discovery of many trephined skulls in the ossuary, or Beinhaus, at Sedlec in Bohemia.<sup>27</sup> In this famous bone-heap there are pyramids of skulls and thousands of human bones. Tradition states that they came from the old churchyard of Sedlec, the soil of which, having been made sacred by admixture with earth brought from Gethsemane, had the property of rapidly decaying the flesh and of preserving the bones with a whiteness as of alabaster. The structure which now incloses the relics was erected in 1709, but allusions to the Sedlec bones are to be found in very early chronicles. A local legend relates that the perforated skulls (of which there are a great many) once belonged to the Cistercian and Carthusian monks who were killed when the Hussites, under Ziska, captured the convent of Sedlec in 1421. Dr. Dudik thinks that the punctures are too even and too free from fracture to have been made by the spiked clubs with which Ziska's followers were armed. This objection is probably not well-founded. The writer remembers examining a heap of skulls of horses in a knacker's yard, the animals having been destroyed with a pole-axe, a weapon very similar to a spiked club, and the punctures were, in almost all instances, round with sharp edges and not accompanied by fracture. It seems probable that these bones have accumulated through a very long period of time, but that they date principally from the year 1318, when a pestilence ravaged Bohemia and thirty thousand persons were buried in Sedlec alone.

<sup>26</sup> Wankel (H.). Ein prähistorischer Schädel mit einer halbgeheilten Wunde auf der Stirne höchstwahrscheinlich durch Trepanation entstanden. Mitth. d. anthrop. Gesellsch. in Wien, 1878, vii, 86-95.

<sup>27</sup> Dudik (B.). Ueber trepanirte Cranien im Beinbause zu Sedlec. Ztschr. f. Ethn., Berl., 1878, x, 227-235.



Dr. Dudik describes at some length the appearance of the openings in the crania which he examined, but it would seem from his description that, in most instances, posthumous trephining alone had been practiced. This, of course, proves nothing. In a few cases he describes what seems like cicatrization of the edges

A more competent observer, however, followed in his footsteps. Professor Wankel visited Sedlec in order to verify the observations of Dr. Dudik, and examined the one hundred and twenty crania which had been submitted to the latter.<sup>28</sup> Wankel was of opinion that, in every instance, the perforations were the result of wounds not immediately fatal. In two instances he agreed with Dr. Dudik that there were unmistakable marks of posthumous trephining. Professor Wankel finishes his article by a description of his visit to Prague, in the museum of which city he found two skulls from Bilin, in Bohemia, exhibiting evidence of prehistoric trephining. One, a dolicocephalic skull, presented an orifice 60 millimeters by 40, of elliptic shape, and situated in the center of the right parietal bone. The edges were perfectly cicatrized, and exhibited the ivory-like surface characteristic of long-healed trephining. In the other, a mesocephalic skull, the aperture was round and about 40 millimeters in diameter. Professor Wankel was of opinion that these skulls exhibited perfect specimens of prehistoric surgical trephining, and goes on to observe that, even to the eye of a layman, the difference between the holes in these skulls and those in the crania of the Sedlec ossuary was most marked.

A notice of these two interesting specimens was sent to the Paris society by M. Ingoald Cludset two years before.<sup>29</sup>

Professor Virchow has contributed some observations illustrative of the subject. At a meeting of the Berlin Anthropological Society, in 1879, he described a skull from a neolithic burial mound, in which the characteristic marks of cicatrization were observed in an opening in the right parietal bone. At a later meeting he also reported some discoveries made by General von Erckert in a Cujavian grave near Ziemcin, in Poland. Among them was a bone disk, or rondelle, bearing a great resemblance to

<sup>28</sup> Wankel (H.). Ueber die angeblich trepanirten Cranien des Beinhauses zu Sedlec in Böhmen. Mitth. d. anthrop. Gesellsch. in Wien, 1879, viii, 352-360.

<sup>29</sup> Bull. Soc. d'anthrop. de Paris, 1877, 2<sup>me</sup> sér., xii, 10.

those described by Broca.<sup>30</sup> Dr. L. Schneider presented to the same society a similar example from the skulls of Strupcic, Bohemia.<sup>31</sup>

In 1875 an article was published by Dr. R. Wiedersheim, entitled, "Ueber den Mädelfhofener Schädelfund in Unterfranken." This appeared before attention had been drawn to the subject of prehistoric trephining, but in one of the plates is a cranium with an opening in the left parietal bone, presenting a remarkably strong resemblance to the accepted form of surgical operation.<sup>32</sup>

At a meeting of the Italian Society of Anthropology, held in 1878, Professor Mantegazza exhibited a papier-maché model of a Russian skull taken from a tumulus at Bogdanoff, which presented an example of surgical trephining undoubtedly performed during life. Posteriorly was a second aperture of post-mortem origin.<sup>33</sup>

M. Nicolucci discovered in a tumulus in Italy a rondelle from the occipital bone, highly polished on both sides, but no trephined skulls have as yet been discovered in that country.

In Denmark a trephined skull was found in a dolmen at Borreby, and another was discovered by M. Engelhardt, in a dolmen of the stone age, at Noes, in the island of Falster.<sup>34</sup>

Broca received from General Faidherbe some casts of skulls from Roknia, Algeria, one of which proved to be an excellent example of surgical trephining. Since his death another specimen has been received from Roknia, which is deposited in the Musée Broca. In this skull the opening—of the usual beveled, elliptical shape, and 13 millimeters in diameter—is above the left external orbital apophysis. There is no evidence of repair on the edges, so that it would seem that the operation was fatal; but as the entire inner table of the skull has disappeared, from erosion, M. Le Baron suggests that the cicatrized edges may have met with a similar fate.<sup>35</sup>

So far no discoveries of trephined crania have been made in Great Britain;

<sup>30</sup> Ueber trepanirte Schädel von Giebichenstein. Verhandl. der Berliner Gesellsch. für Anthropol., Berlin, 1879, 64-67. ——. Knochenscheibe aus einem Schädel, welche an ein trepanirtes Stück erinnert. *Ibid.*, 436.

<sup>31</sup> Ueber die Hradiste von Stradonice und die Schädel von Strupcic (Böhmen). *Ibid.*, 239.

<sup>32</sup> Archiv für Anthropol., Braunschweig, 1875-76, viii, 225-236. (Plate XV, figs. 1 and 2.)

<sup>33</sup> Archivio per l' antropologia, etc., Milano, 1878, viii, 527.

<sup>34</sup> de Nadaillac. Les trépanations préhistoriques. Paris, 1879. 8°, p. 7.

<sup>35</sup> Lésions osseuses, etc., 67.



but it may be mentioned, as illustrating the growth of interest in the subject, that in France counterfeit rondelles have recently been put upon the market.

In the splendid prehistoric gallery of the geological section of the museum at Lisbon is a cranium quite unique of its kind.<sup>36</sup> It presents evidence of an uncompleted operation of trephining upon the left parietal bone. The groove, made by some cutting or sawing instrument, has nearly reached the internal table, very clearly defining the rondelle, which measures 6 centimeters by 2, and from the numerous scratches on the surrounding bone it is evident that the instrument frequently slipped from the groove in the process. Why the piece was not entirely detached it is useless to surmise. M. de Mortillet was of opinion that the discovery rather tended to disprove Broca's theory that the operation was performed by scraping until a hole was produced. It must be observed, however, that there is no evidence to prove that the operation was performed during life in the case in question. It is more likely that it was an attempted post-mortem trephining; but even if it were not, its occurrence would only strengthen the views expressed elsewhere in this paper, that though prehistoric trephining was probably performed by scraping in the young subject, and that examples of this method form the great majority of specimens in our museums, yet that it is probable, from analogy, that when performed on the adult it was by sawing, cutting, or by a series of punctures.

The cranium in question was found in the grotto of Casa da Mouva at Peniche, which contains the remains of one hundred and forty persons of the neolithic period.

In America nothing has been discovered that can be said to belong to prehistoric trephining, except the famous Inca skull brought by Mr. Squier from Peru, and presented by him to the Paris Society of Anthropology. This relic, which consists of the face and frontal bone, is stated by Mr. Squier to have been taken from an Inca cemetery in the valley of Yucay, within one mile of the "Baths of the Incas."<sup>37</sup>

<sup>36</sup>Notes sur l'archéologie préhistorique en Portugal, par Ém. Cartailhac. Bull. Soc. d'anthrop. de Paris, 1881, 3<sup>me</sup> sér., iv, 281-307.—Trépanation préhistorique, par A. de Mortillet. *Ibid.*, 1882, 3<sup>me</sup> sér., v, 143-146.

<sup>37</sup>Peru. Incidents of travel and exploration in the land of the Incas. By E. George Squier. New York, 1877. 8°, p. 456; Appendix, p. 577. It is also described in that singularly unique publication, vol. i, No. 1 (all ever published), of the Journal of the Anthropological Institute of New York for 1871-'72.

The drawing (Plate VII) shows how entirely the operation in this case differs from the elliptic openings of the French crania. The round white spot indicates where the periosteum had been removed by the operator; and this was done, Broca thought, about eight or ten days before death. The famous surgeon, Nélaton, who also examined the bone, suggested fifteen days.<sup>33</sup> As no evidence of fracture was visible, the French experts were of opinion that the operation was performed to evacuate fluid in the cavity, but Dr. J. P. Nott, of Mobile, offered the very plausible suggestion that a punctured wound, such as the known weapons of the Peruvians might inflict, might have necessitated the operation. The incisions appear to have been performed with a cutting instrument, something like an engraver's *burin*, and not with a saw.

In 1875, Mr. Henry Gilman, then of Detroit, published a description of ten to fifteen skulls obtained from mounds on Sable River, Lake Huron, and two fragments from Great Mound, River Rouge, Michigan.<sup>39</sup> All of these skulls presented a circular perforation at the vertex, "evidently made," he says, "by boring with a rude, probably stone, instrument, varying in size, in some instances having a diameter of one-third of an inch; in others, of one-half of an inch, and flaring at the surface" (fig. 1).

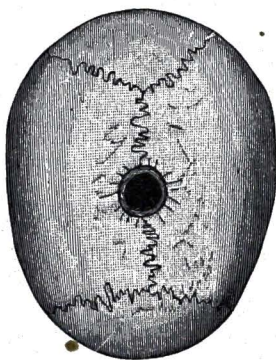


FIG. 1.—Artificially perforated skull from mound at Sable River (Lake Huron), Michigan; one-quarter size.

At the Detroit meeting of the American Association for the Advancement of Science, Mr. Gilman read a more elaborate paper on the same subject,<sup>40</sup> and, at the twenty-sixth meeting of the society, this was followed by another paper, entitled, "Additional facts concerning artificial perforation of the cranium in ancient mounds in Michigan."<sup>41</sup> Mr. Gilman was very positive that the perforations were not analogous to the prehistoric trephining observed in France. They were merely holes bored after death, and it was suggested by Professor Mason that, like the Dyaks of Borneo, the natives

<sup>38</sup> Bull. Soc. d'anthrop. de Paris, 1867, 2<sup>me</sup> sér., ii, 403.

<sup>39</sup> Amer. Naturalist, Salem, 1875, ix, 473.

<sup>40</sup> Proc. Am. Ass. Adv. Science, 24th meeting, at Detroit, 1875, Salem, 1876, 316-331.

<sup>41</sup> *Ibid.*, 26th meeting, at Nashville, 1877, Salem, 1878, 335-339.





**The Inca skull brought by Mr. Squier from Peru.  
(Photographed at Army Med. Museum.)**





might have made the punctures for the convenience of stringing the skulls. This would explain why the hole was invariably at a point opposite to the foramen magnum. A discovery of Mr. Gilman's, however, seems to throw some doubt upon this theory. He found, in a mound at Devil River, Michigan, the remains of a person, evidently of rank, lying upon his back, but with the characteristic perforation in his skull.

Mr. W. C. Holbrook, in an account of his examination of some Indian mounds on Rock River, at Sterling, Ill., says:

Inside this dolmen I found the remains of eight human skeletons. . . . One of the skulls presented a circular opening about the size of a silver dime. This perforation had been made during life, for the edges had commenced to cicatrize.<sup>42</sup>

It is not stated in what part of the skull the opening was found, nor whether any evidences of fracture or other injury existed, so that, as it stands, the case cannot be thought to be one of trephining, but rather one of a partly healed wound.

Before concluding this review of the evidence so far accumulated upon the subject, some account must be given of the method of trephining practiced in our own day by some semi-barbarous tribes, with the purpose of seeing whether it throws any light on the prehistoric operation.

In the djebel Aouràs (Mont Aurès), the southern termination of the Atlas mountain range, in the province of Constantine, in Algeria, there exists a race of Kabyles who are the descendants of the Berbers, the genuine autochthones of Africa. The practice of trephining prevails extensively among them, although it is by no means general among other tribes of Kabyles. Two French army surgeons, MM. L.-T. Martin<sup>43</sup> and Amédée Paris,<sup>44</sup> have given very full accounts of the method adopted.

It appears that the operation is performed for fracture of the skull, whether simple or compound, for disease of the bone, and for violent pains in the head. It may be performed at any age, upon either sex, and upon any part of the skull, though the parietal bones seem to be most frequently

<sup>42</sup> Amer. Naturalist, Salem, 1877, xi, 688.

<sup>43</sup> La trépanation du crâne, telle qu'elle est pratiquée par les Kabyles de l'Aurès. Par L.-T. Martin. Le Montpellier méd., 1867, xviii, 525-535. Also, Reprint.

<sup>44</sup> De la trépanation céphalique pratiquée par les médecins indigènes de l'Aouress (province de Constantine). Par M. le dr. Amédée Paris. Gazette méd. de l'Algérie, Alger, 1868, xiii, 25-28. Also, Reprint.

chosen. M. Paris did not meet with any instances in which the operation had been performed upon subjects of less than ten or more than sixty years of age.

The instruments are rude and simple enough, consisting of a razor, a serpette, one or two saws, some straight and curved elevators, and the *brima*, or perforator. This latter is a metal rod, as thick as a ramrod, with a point an eighth of an inch long, but not over one-third of the diameter of the rod, which thus forms a shoulder and prevents too deep a penetration of the instrument. (See Plate VIII.) The point being fixed in the bone, after removal of the scalp by a crucial incision, the rod is taken between the hands of the operator, and by a rapid to-and-fro motion is made to revolve so that a puncture is produced. This is followed by another and another, until the fracture or the portion of bone intended to be removed is surrounded with a row of these holes, very close together. The saw is used to run them one into the other, and by means of the elevator the fragment is removed. The dentated edges are smoothed, a shield is fastened over the aperture, and appropriate dressings, with many ceremonies, applied. The operation is performed with great slowness, and is not generally completed at one sitting. It must, one would think, be exquisitely painful, but it is held to be a point of honor to exhibit no evidence of suffering, and if the patient should be so weak as to utter cries, he is jeered at, and even beaten.

The foregoing description of the method of operating is taken from the article by M. Martin. There is a difference in the procedure as related by M. Paris, who does not mention the use of the *brima* or of any analogous instrument. He says that the *thebibe* cuts out a square piece of bone, inclusive of the injured portion, with a saw, lifting the fragment with the elevator. Great violence is sometimes used in this part of the operation, and a portion of the outer or inner table is occasionally forced off, as in the accompanying figure; the bone from which it was drawn was in the possession of M. Paris.

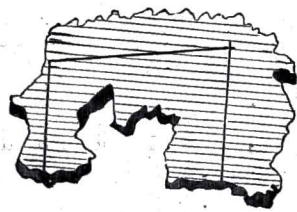


FIG. 2.—Fragment from Kabyle skull, forcibly broken out in the operation.



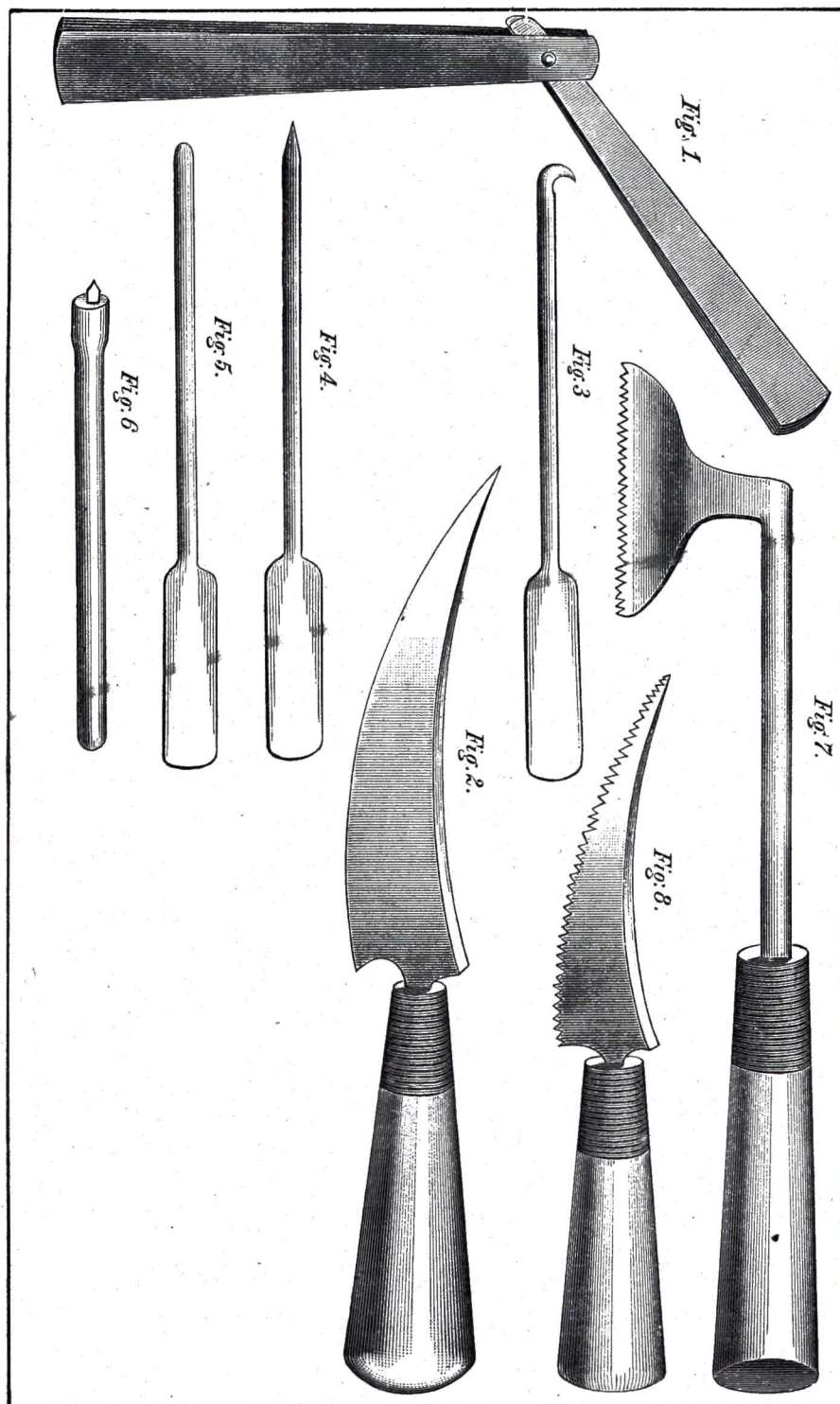


FIG. 1. Mous (razor).  
FIG. 2. Boussadi (knife).  
FIG. 3. El-Chretai (hook).  
FIG. 4. Mesella (elevator).

FIG. 5. Chefra (elevator).  
FIG. 6. Brima (perforator).  
FIG. 7. Menchar (saw).  
FIG. 8. Boussadi converted into saw.

Half-size. (Martin.)





The *thebibe* (operator) is a sort of semi-priest who has inherited the right to exercise his function; the operation, the instruments, the dressings, are all sacred, and the patient is held in reverence after recovery. The dressings consist mainly of woman's milk and of butter; the former obtained from a woman who has duly performed her religious rites. Both these ingredients figure in ceremonial observances in the Orient.

It is impossible to draw any conclusion as to the results of this process of trephining. The *thebibes* insist that it is always successful, but Arab mendacity is proverbial, and neither M. Paris nor M. Martin gives any credence to their statements. When commencing the incisions, the *thebibe's* formula is thus pronounced: *Thou wilt recover if it please God*. If the patient succumb, his family are told: *It was written*.

The natives, however, certainly regard the operation as without danger to life, and it is even resorted to as a means of extortion. M. Paris relates that two men having quarreled, one struck the other a blow on the body with a stick. Some days after the latter had his head trephined for a pretended fracture and sued his enemy for damages. The deception was exposed, and both patient and surgeon were punished. The *dieh*, or price of blood, is rigorously exacted among them, every injury, even a fatal one, having its established price. M. Martin mentions that he has seen men upon whom trephining had been practiced five or six times, so that their heads were monstrously disfigured. It is to be borne in mind that in these cases the operation was performed at intervals of time for different injuries.

A remarkable case has been recently published in which the patient was trephined five times within five years.<sup>45</sup> The disease of the bone for which these successive operations were performed originated in blows received in a brawl in 1875. The last trephining took place in 1880, and, so far, appears to have been successful.

In Otaheite, the operator's armamentarium consists of pieces of broken glass bottles for scraping, or, sometimes, of flints, shark's teeth for incisions, and pieces of gourd with shark tendons for strings with which to cover the opening produced. A missionary at Uvea, one of the South Sea Islands,

<sup>45</sup> A case of repeated trephining. By P. B. McCutcheon. New Orleans Med. & Surg. Journal, 1881, ix, 259-261.

gives a very clear and interesting account of the method of trephining practiced at that spot.<sup>46</sup> He says:

A very surprising operation is performed on the island of Uvea, in the Loyalty group. A notion prevails that headache, neuralgia, vertigo, and other cerebral affections proceed from a crack in the head or pressure of the skull on the brain. The remedy is to lay open the scalp with a cross or **T** incision, then scrape the cranium carefully and gently with a piece of glass until a hole is made into the skull, down to the dura mater, about the size of a crown piece. Sometimes this scraping operation will be even to the pia mater by an unskillful surgeon, or from the impatience of the friends, and death is the consequence. In the best of hands about half of those who undergo the operation die from it. Yet this barbarous custom, from superstition and fashion, has been so prevalent that very few of the male adults are without this hole in the cranium, or "have a shingle loose," to use an Australian phrase. I am informed that sometimes an attempt is made to cover the membranes of the cranium so exposed by placing a piece of cocoanut shell under the scalp. For this purpose they select a very hard and durable piece of shell, from which they scrape the softer parts and grind quite smooth, and put this as a plate between the scalp and skull. Formerly the trephine was simply a shark's tooth; now a piece of broken glass is found more suitable or less objectionable (if we may even so qualify the act). The part of the cranium generally selected is that where the coronal and sagittal sutures unite, or a little above it, upon the supposition that there the fracture exists.

The semi-religious character of all and everything concerned in the operation amongst the Kabyle tribes of Algeria is of special interest, as it seems to strengthen, by analogy, the theory that the subjects of prehistoric trephining acquired thereby a sacred character which led to the wearing of amulets from their skulls, as already described.

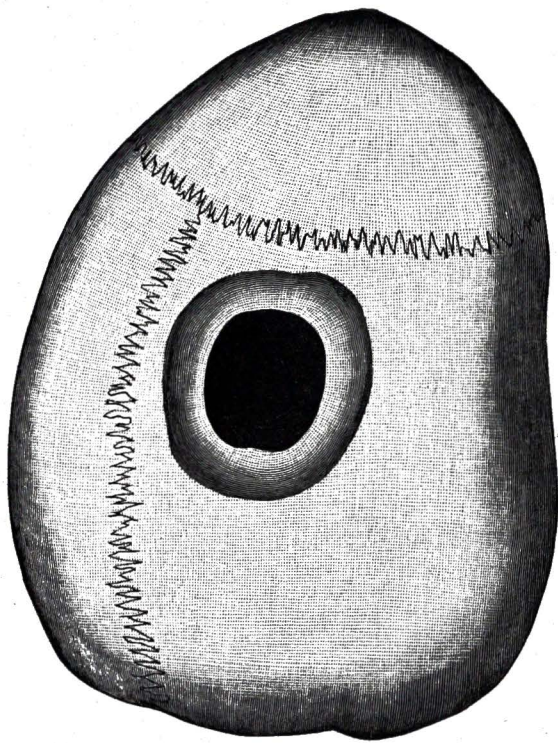
The curious suggestion has been made that the tonsure of priests is a perpetuation of the ancient custom of trephining. The Abbé Martigny, in his Dictionary of Christian Antiquities, says that the oldest Christian mosaics and manuscripts represent St. Peter with the tonsure as a mark of pre-eminence over the other apostles. It is probable that no weight should be attached to this fact. The picture galleries of Europe abound in Holy Families where tonsured monks of various orders are adoring the infant Christ—anachronisms which did not trouble the old masters. We know, too, that Brahmin priests, of a period long anterior to the Christian era, are represented as tonsured. This does not, of course, affect the question of the possible origin of the tonsure from the supposed sacred custom of trephining, but the matter may be safely left as unsettled.

The discoveries which have been made of late in mapping out the convolutions of the brain, or, as it is termed, the localization of function, have led to the reintroduction of trephining from a highly scientific stand-

<sup>46</sup> Native medicine and surgery in the South Sea Islands, by the Rev. Samuel Ella. *Med. Times & Gaz.*, Lond., 1874, i, 50.







Cranium artificially trephined by M. Championnière.

point. Given, in injury of the head or abscess of the brain, the failure of a function, the locality of that function being known, there is the place to trephine. Some very remarkable results have been attained, and the consequence is that trephining has again become popular in France. Broca deserves the credit of being among the first to initiate this method of trephining.<sup>47</sup> This matter is referred to because a distinguished French surgeon, M. Lucas-Championnière, published a work upon the subject about four years ago, and in the introduction, speaking of prehistoric trephining, he takes the ground that the operation was not performed by scraping, as Broca supposed, but by a series of punctures such as have been described as produced by the Algerian operator.<sup>48</sup> To prove this, he took a flint weapon, and drilling a series of holes in a skull, afterwards ran them one into the other and removed the piece. The serrations were easily smoothed off with a piece of flint. The result could not be distinguished from the opening produced by scraping, the beveled edges being alike. (See Plate IX.)

This is ingenious and surprising; but while it must be admitted that the perforations *may* have been made by puncture, yet the existence of a considerable number of skulls *partially* trephined, the outer table only having been unmistakably *scraped* away, offers a strong presumption in favor of the latter method.

The following conclusions may be permitted:

1. The large number of perforated neolithic crania exhibiting cicatrized edges establishes the existence of a custom of trephining.
2. The operation was performed on both sexes, and generally at an early age.
3. The purpose is doubtful, but from analogy it would seem to have been for the relief of disease of brain, injury of skull, epilepsy or convulsions.
4. The operation was probably performed by scraping; possibly by a series of punctures. It is likely that the first was employed for children and the latter for the harder skulls of adults.

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<sup>47</sup> M. Legouest, the professor of military surgery at Val de Grâce, formulates this remarkable rule: "Singular as it may appear, I think the rule is that you should always trephine when you are doubtful whether it ought to be done!"

<sup>48</sup> Étude historique et clinique sur la trépanation du crâne; la trépanation guidée par les localisations cérébrales. Par Just Lucas-Championnière. Paris, 1878. 8°, p. 12.



5. Posthumous trephining consisted in removing fragments of the skull of a person who had undergone surgical trephining.

6. Each fragment was to exhibit a portion of the cicatrized edge of the original operation; and the purpose was, probably, to form an amulet to protect from the same disease or injury for relief of which the operation had been performed.

7. The evidence so far confines the custom to neolithic man on the continent of Europe.

#### ADDITIONAL NOTE.

Since the foregoing was printed a curious discovery has been made of something like "post-mortem trephining" in a remote region. Dr. Dybowski, who has been traveling in Yessel and the Aino lands, sent eight Aino skulls to Mr. Kopernicki, who observed in five of them that a resection of the foramen magnum had been performed in what he described as "a systematic manner analogous to the trephined skulls of the French dolmens." In one skull a portion only of the edge of the foramen magnum had been cut out; in another the alveolar process had been sawn off. He supposed that the purpose of the resection was not ceremonial, but medical, and that the excised bone was to be used as a remedy. Nothing is known of trephining among the Ainos.

Mr. Kopernicki sent the description of these skulls to the Ethnological Society of Berlin, and Professor Virchow remarked that there was no doubt that an artificial removal of fragments of bone had taken place, generally from the posterior and lateral sections of the border of the foramen magnum and the adjacent parts. In the three Aino skulls in his own collection nothing of the kind was to be seen, but a Goldi skull and a New Brandenburg skull presented similar lesions. He had supposed them, in the latter case, to be due to an attempt to make a drinking-cup of the skull, it having been found in the earth without any other parts of a skeleton, and in the frontal bone two small holes had been made as if for strings. The five Aino skulls in question had been dug out of graves by Dr. Dybowski himself, and he did not think the drinking-cup theory was applicable to them. He was unable to give any opinion as to the object of these resections.<sup>49</sup>

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<sup>49</sup> *Zeitschrift für Ethnologie*, Berlin, 1881, xiii, 191-192. See, also, foot-note 3, p. 6 *ante*.

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DEPARTMENT OF THE INTERIOR  
U. S. GEOGRAPHICAL AND GEOLOGICAL SURVEY OF THE ROCKY MOUNTAIN REGION  
J. W. POWELL IN CHARGE

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A STUDY  
OF THE  
MANUSCRIPT TROANO

BY  
CYRUS THOMAS PH. D.

WITH AN  
INTRODUCTION BY D. G. BRINTON M. D.



WASHINGTON  
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## PREFACE

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I am fully aware that this paper bears the marks of haste and gives evidence of the fact that a number of the more important points are not worked out as thoroughly and completely as they might have been had more time been devoted to them. But the growing interest in the public mind in reference to all that relates to the past history of our continent has induced me to present it in its present incomplete form rather than defer its publication to an indefinite period in the future. It is therefore offered to the public more as a tentative work than with the expectation that all my conclusions will stand the test of criticism.

I have endeavored, as will be seen by an examination of its contents, to confine my studies as strictly as possible to the Manuscript itself, without being influenced in my conclusions by the conclusions of others—using Landa's "*Relacion*," Perez's "*Cronologia*," Brasseur's works, and the Dresden Codex as my chief aids; not intending by any means to ignore the valuable work done by others in the same field, but that I might remain as free as possible to work out results in my own line of thought.

I may also add that at the time the main portion of the paper was written I was in the West, out of reach of any extensive library containing works relating to the history, antiquities, &c., of Mexico and Central America. This fact I mention as an apology for the comparatively few works referred to in the paper.

I have studied the Manuscript somewhat in the same way the child undertakes to solve an illustrated rebus, assuming as a standpoint the status of the semi-civilized Indian, and endeavoring, as far as possible, to proceed upon the same plane of thought. In other words, I have not proceeded upon the assumption that the pre-Columbian Indians of Yucatan were learned phi-



losophers, thoroughly versed in science and general knowledge, but were *Indians*, who through some influence, whether introduced or indigenous, had made considerable advance in certain lines of art and science. But these lines, as I believe, were few and limited, relating chiefly to architecture, sculpture, painting, and the computation of time.

As an examination of the Manuscript soon satisfied me that it was, to a great extent, a kind of religious calendar, I found it necessary first to discuss the Maya chronological system in order to make use of the numerous dates found in the work—a fact that will explain why so many pages of the first part of the paper are devoted to this subject.

The results of my investigations are summed up at the close of this preface. I find the work consists of two parts: first, a calendar giving the dates of religious festivals running through a long period of time, in all probability a grand cycle of three hundred and twelve years, together with brief formulas; second, an illustration of the habits, customs, and employments of the people. But these two subjects are mingled together throughout the Manuscript; the first including most of the characters or hieroglyphics around the spaces; the second the figures in the spaces.

One omission in my paper will be observed by those who are familiar with the subject, that is, the failure on my part to notice and account for, in the Maya chronological system, the surplus days of the bissextile years. This omission on my part has been intentional. I can find no plan by which to insert them in the series, numbering them as the others, without interfering with that order which is essential to the system itself. I have therefore proceeded upon the assumption that they are added as uncounted days, and hence interfere in no way with the regular order. If I am mistaken in this conclusion, considerable modification in my tabular arrangement of the years may be necessary, even though the general plan be correct.

A very serious drawback to the attempt to explain the written characters or hieroglyphics has been the lack on my part of a knowledge of the Maya language. Such a knowledge I do not claim; therefore, in this part of the work, the best I could do was to quote from the lexicons, as there given, such words as I found it necessary to refer to. The propriety of attempting anything in this direction without this knowledge may be justly

questioned. But after seriously considering this point, I concluded it best to give to the world the result of my investigations with these explanations, as I felt confident I had made some progress in deciphering this mysterious Manuscript.

I take this opportunity of acknowledging the obligations I am under to Dr. D. G. Brinton, of Philadelphia, for the valuable notice of the Maya Manuscripts which he has contributed as an introduction to my paper.

#### RESULTS OF MY INVESTIGATIONS OF THE MANUSCRIPT TROANO.

These may be briefly summed up as follows:

1st. That the work was intended chiefly as a ritual or religious calendar to guide the priests in the observance of religious festivals, and their numerous ceremonies and other duties. That the very large number of day columns and numerals, which form fully one-half of what may be called the written portion, are simply dates which appear to run through one entire grand cycle of 312 years, fixing the time when festivals should be held and other religious observances take place. Also that much of the text proper—the portion in hieroglyphics or written characters—is purely ritualistic, consisting of very simple formulas.

2d. That the figures in the spaces are in some cases symbolical, in others simple pictographs, and, in quite a number, refer to religious ceremonies, but that in many instances they relate to the habits, customs, and occupations of the people—as, for example, their method of capturing game, which, as appears from this work, was as stated by Herrera, chiefly by “gins and traps”—and the incidents of the chase; that which relates to the business of the apiarists; making ropes; the manufacture of idols; agricultural pursuits; occupation and duties of the females, &c. But even here we see the religious element pervading everything.

3d. That the work appertained to and was prepared for a people living in the interior of the country, away from the sea-shore. This is inferred from the fact that nothing is found in it relating to fishermen, or their vessels.



But there are reasons for believing that it pertained to a comparatively well-wooded section.

4th. That the people of the section where it was prepared were peaceable, not addicted to war; and were sedentary, supporting themselves chiefly by agricultural products, though relying upon their "gins and traps" and the chase to supply them with animal food. Twelve of the plates (VIII to XIX) are devoted to this latter subject; ten (I\* to X\*) to the business, festivals, &c., of the apiarists and honey-gatherers; and ten (XXIV to XXXIII) to rains, storms, and agricultural pursuits.

The execution and character of the work itself, as well as its contents, bear testimony to the fact that the people were comparatively well advanced in the arts of civilized life. But there is nothing here to warrant the glowing descriptions of their art and refinement given by some of the earlier as well as more modern writers, nor even to correspond with what might be inferred from the architectural remains in some parts of Yucatan. We find in the work indications of stone and wooden houses, but generally with thatched roofs; at least they always have wooden supports, and are of a temporary character.

The dress of the males appears to have consisted of a strip of cloth (probably cotton), passed once or twice around the loins, with one end hanging down behind and the other in front, or a small flap in front and the ends behind. That of the females consisted of a skirt fastened at the waist and hanging down to the ankles. A kind of broad anklets and wristlets appear also to have been quite common with the better class, but the feet were always bare. The women parted their hair in the middle, that of the matrons or married women not being allowed to hang down, while that of the younger or unmarried ones was allowed to hang in long locks behind.

Mats alone seem to have been used as seats.

The pottery, so far as I can judge by what is shown in the Manuscript (and in this prefatory statement I confine my remarks strictly to what seems to be shown here, unless otherwise expressly stated), was of an inferior grade as to form and decoration, but it is worthy of notice that pots with legs were common. Some censers in the form of a snake's neck and head are the best specimens represented.



In planting their corn (maize) it was dibbled in with a curved stick, five grains to a hill being the established number. While at this work they wore a peculiar head-covering, apparently a kind of matting. The other cultivated plants noticed in the work appear to be cacao, cotton, and a leguminous species, probably a climbing bean, as it is supported by a stake.

I judge, from a number of the figures, that their corn while growing was subject to the attacks of numerous insects (represented as worms or snakes), which ate foliage, ear, and root, and was frequently injured by severe storms, and also that the planted grains were pulled up by birds and a small quadruped. Their crops were also subject to injury by severe droughts, accompanied by great heat.

The production of honey seems to have been a very important industry in the section to which the work relates, but so far I have succeeded in interpreting but few of the figures which refer to it.

Rope-making (or possibly weaving) is represented on Plate XI\*—a very simple process, which will be found described in my paper.

Their chief mechanical work, as I judge from this Manuscript, was the manufacture of idols, some being made of clay and others carved of wood. Two implements used in making their wooden images appear, from the figures, to have been of metal, one a hatchet, the other sharp-pointed and shaped much like a pair of shears.

Spears and arrows (if such they be, for there is no figure of a bow in the entire work), or darts, are the only implements of warfare shown. The spears or darts seem to have been often thrown by means of a kind of hook, and guided by a piece of wood with a notch at the end.

5th. The taking of life, apparently of a slave, is indicated in one place, but whether as a sacrificial offering is uncertain. It is evidently not in the manner described by the early writers, as in this case it is by decapitation with a machete or hatchet, the arms being bound behind the back, and what is presumed to be a yoke fixed on the back of the head. This is the only thing in the Manuscript, except holding captives by the hair, as in the Mexican Codices, which can possibly be construed to indicate human sacrifice. In the Dresden Codex human sacrifice in the usual way—by opening the breast—is clearly indicated.

6th. We learn from the figures in the Manuscript that the cross in some of its forms was in use among this people as a religious emblem, and also that the bird was in some cases brought into connection with it, as at Palenque.

7th. In regard to the written characters I have reached the following conclusions:

That, although the movement of the figures is from the right to the left, and the plates should be taken in this way, at least by pairs, yet, as a general rule, the characters are in columns, to be read from the top downwards, columns following each other from left to right; that when they are in lines they are to be read from left to right and by lines from the top downwards, but that lines are used only where it is not convenient to place the characters in columns. The correctness of this conclusion is, I think, susceptible of demonstration by what is found in the Manuscript.

8th. That there is no fixed rule in reference to the arrangement of the parts of compound characters. The few which I have been able to decipher satisfactorily appear to have the parts generally arranged in an order nearly or quite the reverse of that in which the characters themselves are placed.

9th. That the characters, while to a certain extent phonetic, are not true alphabetic signs, but syllabic. Nor will even this definition hold true of them all, as some appear to be ideographic and others simply abbreviated pictorial representations. Most of the characters are compound, and the parts more or less abbreviated, and, as the writing is certainly the work of the priests, we may correctly term it hieratic.

Landa's alphabet, I think, is the result of an attempt on his part to pick out of the compound characters their simple elements, which he erroneously supposed represented letters. The day characters are found in the Manuscript substantially as given by this author, but appear to have been derived from an earlier age, and to have lost in part their original signification. No month characters are found in this work, though common in the Dresden Codex.

10th. That the work (the original, if the one now in existence be a copy) was probably written about the middle or latter half of the fourteenth century. This conclusion is reached first, from internal evidence alone;

second, from this, together with historical evidence. The tribe appears to have been at the time in a peaceable, quiet, and comparatively happy condition, which will carry us back to a time preceding the fall of Mayapan, and before the introduction of Aztec soldiers by the Cocomes.

11th. I think we find conclusive evidence in the work that the Ahau or Katun was a period of 24 years, and the great cycle of 312; also, that the series commenced with a Cauac instead of a Kan year, as has been usually supposed.

Lastly, I add that I think Brasseur was right in supposing that this work originated in that section of the peninsula known as Peten.

CYRUS THOMAS.





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## INTRODUCTION.

BY DANIEL G. BRINTON, M. D.

### THE GRAPHIC SYSTEM AND ANCIENT RECORDS OF THE MAYAS.

#### 1.—INTRODUCTORY.

One of the ablest of living ethnologists has classified the means of recording knowledge under two general headings—Thought-writing and Sound-writing.<sup>1</sup> The former is again divided into two forms, the first and earliest of which is by pictures, the second by picture-writing.

The superiority of picture-writing over the mere depicting of an occurrence is that it analyzes the thought and expresses separately its component parts, whereas the picture presents it as a whole. The representations familiar among the North American Indians are usually mere pictures, while most of the records of the Aztec communities are in picture-writing.

The genealogical development of Sound-writing begins by the substitution of the sign of one idea for that of another whose sound is nearly or quite the same. Such was the early graphic system of Egypt, and such substantially to-day is that of the Chinese. Above this stands syllabic writing, as that of the Japanese, and the semi-syllabic signs of the old Semitic alphabet; while, as the perfected result of these various attempts, we reach at last the invention of a true alphabet, in which a definite figure corresponds to a definite elementary sound.

It is a primary question in American archæology, How far did the most

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<sup>1</sup> Dr. Friedrich Müller, *Grundriss der Sprachwissenschaft*, Band i, pp. 151-156.

cultivated nations of the Western Continent ascend this scale of graphic development? This question is as yet unanswered. All agree, however, that the highest evolution took place among the Nahuatl-speaking tribes of Mexico and the Maya race of Yucatan.

I do not go too far in saying that it is proved that the Aztecs used to a certain extent a phonetic system of writing, one in which the figures refer not to the thought, but to the sound of the thought as expressed in spoken language. This has been demonstrated by the researches of M. Aubin, and, of late, by the studies of Señor Orozco y Berra.<sup>1</sup>

Two evolutionary steps can be distinguished in the Aztec writing. In the earlier the plan is that of the rebus in combination with ideograms, which latter are nothing more than the elements of picture-writing. Examples of this plan are the familiar "tribute rolls" and the names of towns and kings, as shown in several of the codices published by Lord Kingsborough. The second step is where a conventional image is employed to represent the sound of its first syllable. This advances actually to the level of the syllabic alphabet; but it is doubtful if there are any Aztec records entirely, or even largely, in this form of writing. They had only reached the commencement of its development.

The graphic system of the Mayas of Yucatan was very different from that of the Aztecs. No one at all familiar with the two could fail at once to distinguish between the Manuscripts of the two nations. They are plainly independent developments.

We know much more about the ancient civilization of Mexico than of Yucatan; we have many more Aztec than Maya Manuscripts, and hence we are more at a loss to speak with positiveness about the Maya system of writing than about the Mexican. We must depend on the brief and unsatisfactory statements of the early Spanish writers, and on what little modern research has accomplished, for means to form a correct opinion; and there is at present a justifiable discrepancy of opinion about it among those who have given the subject most attention.

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<sup>1</sup>Aubin, *Mémoire sur la Peinture didactique et l'Écriture figurative des anciens Mexicains*, in the introduction to Brasseur (de Bourbourg)'s *Histoire des Nations civilisées du Mexique et de l'Amérique Centrale*, tom. i; Manuel Orozco y Berra, *Ensayo de Descifracion geroglifica*, in the *Anales del Museo nacional de México*, tom. i, ii.



## 2.—DESCRIPTIONS BY SPANISH WRITERS.

The earliest exploration of the coast of Yucatan was that of Francisco Hernandez de Cordova, in 1517. The year following, a second expedition, under Juan de Grijalva, visited a number of points between the island of Cozumel and the Bahia de Terminos.

Several accounts of Grijalva's voyage have been preserved, but they make no distinct reference to the method of writing they found in use. Some native books were obtained, however, probably from the Mayas, and were sent to Spain, where they were seen by the historian Peter Martyr. He describes them in general terms, and compares the characters in which they were written to the Egyptian hieroglyphics, some of which he had seen in Rome. He supposes that they contain the laws and ceremonies of the people, astronomical calculations, the deeds of their kings, and other events of their history. He also speaks in commendation of the neatness of their general appearance and the skill with which the drawing and painting were carried out. He further mentions that the natives used this method of writing or drawing in the affairs of common life.<sup>1</sup>

Although Yucatan became thus early known to the Spaniards, it was not until 1541 that a permanent settlement was effected, in which year Francisco de Montejo, the younger, advanced into the central province of Ceh Pech, and established a city on the site of the ancient town called *Ichcanziho*, which means "the five (temples) of many oracles (or serpents)," to which he gave the name *Mérida*, on account of the magnificent ancient edifices he found there.

Previous to this date, however, in 1534, Father Jacobo de Testera, with four other missionaries, proceeded from Tabasco up the west coast to the neighborhood of the Bay of Campeachy. They were received amicably by the natives, and instructed them in the articles of the Christian faith. They also obtained from the chiefs a submission to the King of Spain; and I mention this early missionary expedition for the fact stated that each chief signed this act of submission "with a certain mark, like an autograph."<sup>2</sup>

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<sup>1</sup> Peter Martyr, decad. iv, cap. viii.

This document was subsequently taken to Spain by the celebrated Bishop Las Casas.<sup>1</sup> It is clear from the account that some definite form of signature was at that time in use among the chiefs.

It might be objected that these signatures were nothing more than rude totem marks, such as were found even among the hunting tribes of the Northern Mississippi Valley. But Las Casas himself, in whose possession the documents were, here comes to our aid to refute this opinion. He was familiar with the picture-writing of Mexico, and recognized in the hieroglyphics of the Mayas something different and superior. He says expressly that these had inscriptions, writings, in certain characters, the like of which were found nowhere else.<sup>2</sup>

One of the early visitors to Yucatan after the conquest was the Pope's commissary-general, Father Alonzo Ponce, who was there in 1538. Many natives who had grown to adult years in heathenism must have been living then. He makes the following interesting observation:

"The natives of Yucatan are, among all the inhabitants of New Spain, especially deserving of praise for three things: First, that before the Spaniards came they made use of characters and letters, with which they wrote out their histories, their ceremonies, the order of sacrifices to their idols, and their calendars, in books made of the bark of a certain tree. These were on very long strips, a quarter or a third (of a yard) in width, doubled and folded, so that they resembled a bound book in quarto, a little larger or smaller. These letters and characters were understood only by the priests of the idols (who in that language are called Ahkins) and a few principal natives. Afterwards some of our friars learned to understand and read them, and even wrote them."<sup>3</sup>

The interesting fact here stated, that some of the early missionaries

<sup>1</sup> "Se sujetaron de su propia voluntad al Señorío de los Reies de Castilla, recibiendo al Emperador, como Rei de España, por Señor supremo y universal, e hicieron ciertas señales, como Firmas; las quales, con testimonio de los Religiosos Franciscos, que alli estaban, llevó consigo el buen Obispo de Chiapa, Don Fr. Bartolomé de las Casas, amparo, y defensa de estos Indios, quando se fué á España." Torquemada, *Monarquía Indiana*, lib. xix, cap. xiii.

<sup>2</sup> "Letreros de ciertos caracteres que en otra ninguna parte." Las Casas, *Historia apologetica de las Indias Occidentales*, cap. cxxiii.

<sup>3</sup> *Relacion Breve y Verdadera de Algunas Cosas de las muchas que sucedieron al Padre Fray Alonso Ponce, Commissario General, en las Provincias de la Nueva España*, in the *Coleccion de Documentos para la Historia de España*, tom. lviii, p. 392. The other traits he praises in the natives of Yucatan are their freedom from sodomy and cannibalism.



not only learned to read these characters, but employed them to instruct the Indians, has been authenticated by a recent discovery of a devotional work written in this way.

The earliest historian of Yucatan is Fr. Bernardo de Lizana.<sup>1</sup> But I do not know of a single complete copy of his work, and only one imperfect copy, which is, or was, in the city of Mexico, from which the Abbé Brasseur (de Bourbourg) copied and republished a few chapters. Lizana was himself not much of an antiquary, but he had in his hands the Manuscripts left by Father Alonso de Solana, who came to Yucatan in 1565, and remained there till his death, in 1599. Solana was an able man, acquired thoroughly the Maya tongue, and left in his writings many notes on the antiquities of the country.<sup>2</sup> Therefore we may put considerable confidence in what Lizana writes on these matters.

The reference which I find in Lizana to the Maya writings is as follows:

"The most celebrated and revered sanctuary in this land, and that to which they resorted from all parts, was this town and temples of Ytzamal, as they are now called; and that it was founded in most ancient times, and that it is still known who did found it, will be set forth in the next chapter.

"III. The history and the authorities which we can cite are certain ancient characters, scarcely understood by many, and explained by some old Indians, sons of the priests of their gods, who alone knew how to read and expound them, and who were believed in and revered as much as the gods themselves," etc.<sup>3</sup>

We have here the positive statement that these hieroglyphic inscriptions were used by the priests for recording their national history, and that by means of them they preserved the recollection of events which took place in a very remote past.

Another valuable early witness, who testifies to the same effect, is the Dr. Don Pedro Sanchez de Aguilar, who was *cura* of Valladolid, in Yucatan,

<sup>1</sup> Bernardo de Lizana, *Historia de Yucatan. Devocionario de Nuestra Señora de Izmal, y Conquista Espiritual*. 8vo. Pincia (Valladolid), 1633.

<sup>2</sup> For these facts see Diego Lopez Cogolludo, *Historia de Yucatan*, lib. ix, cap. xv. Cogolludo adds that in his time (1650-'60) Solana's MSS. could not be found; Lizana may have sent them to Spain.

<sup>3</sup> I add the original of the most important passage: "La historia y autores que podemos alegar son unos antiguos caracteres, mal entendidos de muchos, y glossados de unos indios antiguos, que son hijos de los sacerdotes de sus dioses, que son los que solo sabian leer y adivinar, y a quien creian reverenciavan como á Dioses destos."



in 1596, and, later, dean of the chapter of the cathedral at Merida. His book, too, is extremely scarce, and I have never seen a copy; but I have copious extracts from it, made by the late Dr. C. Hermann Berendt from a copy in Yucatan. Aguilar writes of the Mayas:

"They had books made from the bark of trees, coated with a white and durable varnish. They were ten or twelve yards long, and were gathered together in folds, like a palm leaf. On these they painted in colors the reckoning of their years, wars, pestilences, hurricanes, inundations, famines, and other events. From one of these books, which I myself took from some of these idolaters, I saw and learned that to one pestilence they gave the name *Mayacimil*, and to another *Ocnakuchil*, which mean 'sudden deaths' and 'times when the crows enter the houses to eat the corpses.' And the inundation they called *Hunyecil*, the submersion of trees."<sup>1</sup>

The writer leaves it uncertain whether he learned these words directly from the characters of the book or through the explanations of some native.

It has sometimes been said that the early Spanish writers drew a broad line between the picture-writing that they found in America and an alphabetic script. This may be true of other parts, but is not so of Yucatan. These signs, or some of them, are repeatedly referred to as "letters," *letras*.

This is pointedly the case with Father Gabriel de San Buenaventura, a French Franciscan who served in Yucatan about 1670-'80. He published one of the earliest grammars of the language, and also composed a dictionary in three large volumes, which was not printed. Father Beltran de Santa Rosa quotes from it an interesting tradition preserved by Buenaventura, that among the inventions of the mythical hero-god of the natives, *Itzamna*, or *Kinich ahau*, was that of "the letters of the Maya language," with which letters they wrote their books.<sup>2</sup> *Itzamna*, of course, dates back to a misty antiquity, but the legend is of value, as showing that the characters used by the natives did, in the opinion of the early missionaries, deserve the name of *letters*.

<sup>1</sup> Pedro Sanchez de Aguilar, *Informe contra Idolorum cultores del Obispado de Yucatan*. 4to. Madrid, 1639, ff. 124.

<sup>2</sup> "El primero que halló las letras de la lengua Maya é hizo el cómputo de los años, meses y edades, y lo enseñó todo a los Indios de esta Provincia, fué un Indio llamado *Kinchahau*, y por otro nombre *Tzamna*." Fr. Pedro Beltran de Santa Rosa Maria, *Arte del Idioma Maya*, p. 16 (2d ed., Mérida de Yucatan, 1859).

Father Diego Lopez Cogolludo is the best-known historian of Yucatan. He lived about the middle of the seventeenth century, and says himself that at that time there was little more to be learned about the antiquities of the race. He adds, therefore, substantially nothing to our knowledge of the subject, although he repeats, with positiveness, the statement that the natives "had characters by which they could understand each other in writing, such as those yet seen in great numbers on the ruins of their buildings."<sup>1</sup>

This is not very full. Yet we know to a certainty that there were quantities of these manuscripts in use in Yucatan for a generation after Cogolludo wrote. To be sure, those in the christianized districts had been destroyed, wherever the priests could lay their hands on them; but in the southern part of the peninsula, on the islands of Lake Peten and adjoining territory, the powerful chief, Canek, ruled a large independent tribe of Itzas. They had removed from the northern provinces of the peninsula somewhere about 1450, probably in consequence of the wars which followed the dissolution of the confederacy whose capital was the ancient city of Mayapan.

Their language was pure Maya, and they had brought with them in their migration, as one of their greatest treasures, the sacred books which contained their ancient history, their calendar and ritual, and the prophecies of their future fate. In the year 1697 they were attacked by the Spaniards, under General Don Martin de Ursua; their capital, on the island of Flores, in Lake Peten, taken by storm; great numbers of them slaughtered or driven into the lake to drown, and the twenty-one temples which were on the island razed to the ground.

A minute and trustworthy account of these events has been given by Don Juan de Villagutierre Soto-Mayor, in the course of which several references to the sacred books, which he calls *Analtés*, occur.

The king Canek, he tells us, in reading in his *Analtés*, had found notices of the northern provinces of Yucatan and of the fact that his pre-

<sup>1</sup> Diego Lopez Cogolludo, *Historia de Yucatan*, lib. iv, cap. iii. The original is: "No acostumbraban escribir los pleitos, aunque tenian caracteres con que se entendian, de que se ven muchos en las ruinas de los edificios."



decessors had come thence, and had communicated these narratives to his chiefs.<sup>1</sup>

These books are described as showing "certain characters and figures, painted on certain barks of trees, each leaf or tablet about a quarter (of a yard) wide, and of the thickness of a piece of eight, folded at one edge and the other in the manner of a screen, called by them *Analtehes*."<sup>2</sup>

When the island of Flores was captured these books were found stored in the house of the king Canek, containing the account of all that had happened to the tribe.<sup>3</sup> What disposition was made of them we are not informed.

I have reserved until now a discussion of the description of the Maya writing presented in the well-known work of Diego de Landa, the second bishop of Yucatan. Landa arrived in the province in August, 1549, and died in April, 1579, having passed most of the intervening thirty years there in the discharge of his religious duties. He became well acquainted with the language, which, for that matter, is a comparatively easy one, and though harsh, illiberal, and bitterly fanatic, he paid a certain amount of attention to the arts, religion, and history of the ancient inhabitants.

The notes that he made were copied after his death and reached Spain, where they are now preserved in the library of the Royal Academy of History, Madrid. In 1864 they were published at Paris, with a French translation, by the Abbé Brasseur (de Bourbourg).

Of all writers Landa comes the nearest telling us how the Mayas used their system of writing; but, unfortunately, he also is so superficial and obscure that his words have given rise to very erroneous theories. His description runs as follows:

"This people also used certain characters or letters, with which they wrote in their books their ancient matters and their sciences, and with them (*i. e.*, with their characters or letters), and figures (*i. e.*, drawings or pic-

<sup>1</sup> "Porque lo leia su Rey en sus Analtehes, tenian Noticias de aquellas Provincias de Yucatan (que Analtehes, ò Historias, es una misma cosa) y de que sus Pasados avian Salido de ellas." *Historia de la Conquista de la Provincia de el Itza, Reduccion y Progressos de la de el Lacandon*, etc. (folio, Madrid, 1701) lib. vi, cap. iv.

<sup>2</sup> *Ibid.*, lib. vii, cap. i.

<sup>3</sup> "Y en su casa tambien tenia de estos Idolos, y Messa de Sacrificios, y los Analtehes, ò Historias de todo quanto los avia sucedido." *Ibid.*, lib. viii, cap. xiii.



tures), and some signs in the figures, they understood their matters, and could explain them and teach them. We found great numbers of books in these letters, but as they contained nothing that did not savor of superstition and lies of the devil we burnt them all, at which the natives grieved most keenly and were greatly pained.

"I will give here an *a*, *b*, *c*, as their clumsiness does not allow more, because they use one character for all the aspirations of the letters, and for marking the parts another, and thus it could go on *in infinitum*, as may be seen in the following example. *Le* means a noose and to hunt with one; to write it in their characters, after we had made them understand that there are two letters, they wrote it with three, giving to the aspiration of the *l* the vowel *é*, which it carries before it; and in this they are not wrong so to use it, if they wish to, in their curious manner. After this they add to the end the compound part."<sup>1</sup>

I need not pursue the quotation. The above words show clearly that the natives did not in their method of writing analyze a word to its primitive phonetic elements. "This," said the bishop, "we had to do for them." Therefore they did not have an alphabet in the sense of the word as we use it.

On the other hand, it is equally clear, from his words and examples, that they had figures which represented sounds, and that they combined these and added a determinative or an ideogram to represent words or phrases.

The alphabet he gives is, of course, not one which can be used as the Latin *a*, *b*, *c*. It is surprising that any scholar should ever have thought so. It would be an exception, even a contradiction, to the history of the evolution of human intelligence to find such an alphabet among nations of the stage of cultivation of the Mayas or Aztecs.

The severest criticism which Landa's figures have met has been from the pen of the able antiquary, Dr. Phillip J. J. Valentini. He discovered that many of the sounds of the Spanish alphabet were represented by signs or pictures of objects whose names in the Maya begin with that sound. Thus he supposes that Landa asked an Indian to write in the native character the Spanish letter *a*, and the Indian drew an obsidian knife, which,

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<sup>1</sup>Diego de Landa, *Relacion de las Cosas de Yucatan*, pp. 316, 318, *seq.*

says Dr. Valentini, is in the Maya *ach*; in other words, it begins with the vowel *a*. So for the sound *ki*, the Indian gave the sign of the day named *kimich*.

Such is Dr. Valentini's theory of the formation of Landa's alphabet; and not satisfied with lashing with considerable sharpness those who have endeavored by its aid to decipher the Manuscripts and mural inscriptions, he goes so far as to term it "a Spanish fabrication."

I shall not enter into a close examination of Dr. Valentini's supposed identification of these figures. It is evident that it has been done by running over the Maya dictionary to find some word beginning with the letter under criticism, the figurative representation of which word might bear some resemblance to Landa's letter. When the Maya fails, such a word is sought for in the Kiche or other dialect of the stock; and the resemblances of the pictures to the supposed originals are sometimes greatly strained.

But I pass by these dubious methods of criticism as well as several lexicographic objections which might be raised. I believe, indeed, that Dr. Valentini is not wrong in a number of his identifications. But the conclusion I draw is a different one. Instead of proving that this is picture-writing, it indicates that the Mayas used the second or higher grade of phonetic syllabic writing, which, as I have before observed, has been shown by M. Aubin to have been developed to some extent by the Aztecs in some of their histories and connected compositions (see above page xxviii). Therefore the importance and authenticity of Landa's alphabet are, I think, vindicated by this attempt to treat it as a "fabrication."<sup>1</sup>

Landa also gives some interesting details about their books. He writes:

"The sciences that they taught were the reckoning of the years, months, and days, the feasts and ceremonies, the administration of their sacraments, the fatal days and seasons, their methods of divination and prophecies, events about to happen, remedies for diseases, their ancient history, together with the art of reading and writing their books with characters which were written, and pictures which represented the things written.

"They wrote their books on a large sheet doubled into folds, which

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<sup>1</sup> Dr. Valentini's article was published in the *Proceedings of the American Antiquarian Society*, 1880, and also separately.



was afterwards inclosed between two boards which they decorated handsomely. They were written from side to side in columns, as they were folded. They manufactured this paper from the root of a tree and gave it a white surface on which one could write. Some of the principal nobles cultivated these sciences out of a taste for them, and although they did not make public use of them, as did the priests, yet they were the more highly esteemed for this knowledge."<sup>1</sup>

From the above extracts from Spanish writers we may infer that—

1. The Maya graphic system was recognized from the first to be distinct from the Mexican.
2. It was a hieroglyphic system, known only to the priests and a few nobles.
3. It was employed for a variety of purposes, prominent among which was the preservation of their history and calendar.
4. It was a composite system, containing pictures (*figuras*), ideograms (*caracteres*), and phonetic signs (*letras*).

### 3.—REFERENCES FROM NATIVE SOURCES.

We might reasonably expect that the Maya language should contain terms relating to their books and writings which would throw light on their methods. So, no doubt, it did. But it was a part of the narrow and crushing policy of the missionaries not only to destroy everything that related to the times of heathendom, but even to drop all words which referred to ancient usages. Hence the dictionaries are more sterile in this respect than we might have supposed.

The verb "to write" is *dzib*, which, like the Greek *γράφειν*, meant also to draw and to paint. From this are derived the terms *dziban*, something written; *dzibal*, a signature, etc.

Another word, meaning to write, or to paint in black, is *zabac*. As a noun, this was in ancient times applied to a black fluid extracted from the *zabacche*, a species of tree, and used for dyeing and painting. In the sense

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<sup>1</sup> Diego de Landa, *Relacion de las Cosas de Yucatan*, p. 44.



of "to write," *zabac* is no longer found in the language, and instead of its old meaning it now refers to ordinary ink.

The word for letter or character is *uookh*. This is a primitive root found with the same or a closely allied meaning in other branches of this linguistic stock, as, for instance, in the Kiché and Cakchiquel. As a verb, pret. *uootah*, fut. *uooté*, it also means to form letters, to write; and from the passive form, *uookhal*, we have the participial noun, *uookhan*, something written, a manuscript.

The ordinary word for book, paper, or letter, is *huun*, in which the aspirate is almost mute, and is dropped in the forms denoting possession, as *u uun*, my book, *yuunil Dios*, the book of God, *il* being the so-called "determinative" ending. It occurs to me as not unlikely that *uun*, book, is a syncopated form of *uookhan*, something written, given above. To read a book is *xochun*, literally to *count* a book.

According to Villagutierre Soto-Mayor, the name of the sacred books of the Itzas was *analté*. In the printed *Diccionario de la Lengua Maya*, by Don Juan Pio Perez, this is spelled *anahté*, which seems to be a later form.

The term is not found in several early Maya dictionaries in my possession, of dates previous to 1700. The Abbé Brasseur, indeed, in a note to Landa, explains it to mean "a book of wood," but it can have no such signification. Perhaps it should read *hunilté*, this being composed of *hunil*, the "determinative" form of *huun*, a book, and the termination *té*, which, added to nouns, gives them a specific sense, *e. g.* *amayté*, a square figure, from *amay*, an angle; *tzucubté*, a province, from *tzuc*, a portion separated from the rest. It would mean especially the sacred or national books.

The particular class of books which were occupied with the calendar and the ritual were called *tzolanté*, which is a participial noun from the verb *tzol*, passive *tzolal*, to set in order, to arrange, with the suffix *té*. By these books were set in order and arranged the various festivals and fasts.

When the conquest was an accomplished fact and the priests had got the upper hand, the natives did not dare use their ancient characters. They exposed themselves to the suspicion of heresy and the risk of being burnt alive, as more than once happened. But their strong passion for literature remained, and they gratified it as far as they dared by writing in their own

tongue with the Spanish alphabet volumes whose contents are very similar to those described by Landa (above, page xxvi).

A number of these are still in existence and offer an interesting field for antiquarian and linguistic study. Although, as I say, they are no longer in the Maya letters, they contain quite a number of ideograms, as the signs of the days and the months, and occasional cartouches and paintings, which show that they were made to resemble the ancient manuscripts as closely as possible.

They also contain not infrequent references to the "writing" of the ancients, and what are alleged to be extracts from the old records, chiefly of a mystic character. The same terms are employed in speaking of the ancient graphic system as of the present one. Thus in one of them, known as "The Book of Chilan Balam of Chumayel," occurs this phrase: *Bay dzibanil tumenel Evangelistas yetel profeta Balam*—"as it was written by the Evangelists, and also by the prophet Balam," this Balam being one of their own celebrated ancient seers.

Among the predictions preserved from a time anterior to the Conquest, there are occasional references to their books and their contents. I quote, as an example, a short prophecy attributed to Ahkul Chel, "priest of the idols." It is found in several of the oldest Maya manuscripts, and is in all probability authentic, as it contains nothing which would lead us to suppose that it was one of the "pious frauds" of the missionaries.

*"Enhi sibte katune yume, maixtan à naaté;  
Ualac u talel, mac bin ca sabac tu coo pop;  
Katune yume bin uluc, holom uil tucal ya;  
Tali ti xaman, tali ti chikine; ahkinob uil yane yume;  
Mac to ahkin, mac to ahbobat, bin alic u than uoohe,  
Ychil Bolon Ahau, maixtan à naaté?"*

"The lord of the cycle has been written down, but ye will not understand;

He has come, who will give the enrolling of the years;  
The lord of the cycle will arrive, he will come on account of his love;



He came from the north, from the west. There are priests, there are fathers,

But what priest, what prophet, shall explain the words of the books,  
In the Ninth Ahau, which ye will not understand?"<sup>1</sup>

From this designedly obscure chant we perceive that the ancient priests inscribed their predictions in books, which were afterward explained to the people. The expression *bin alic u than uoche*—literally, "he will speak the words of the letters"—seems to point to a phonetic writing, but as it may be used in a figurative sense, I shall not lay stress on it.<sup>2</sup>

#### 4.—THE EXISTING CODICES.

The word *Codex* ought to be confined, in American archæology, to manuscripts in the original writing of the natives. Some writers have spoken of the "Codex Chimalpopoca," the "Codex Zumarraga," and the "Codex Perez," which are nothing more than manuscripts either in the native or Spanish tongues written with the Latin alphabet.

Of the Maya Codices known, only three have been published, which I will mention in the order of their appearance.

*The Dresden Codex.*—This is an important Maya manuscript preserved in the Royal Library at Dresden. How or when it came to Europe is not known. It was obtained from some unknown person in Vienna in 1739.

<sup>1</sup> I add a few notes on this text:

*Enhi* is the preterit of the irregular verb *hal*, to be, pret. *enhi*, fut. *enac*. *Katun yum*, father or lord of the Katun or cycle. Each Katun was under the protection of a special deity or lord, who controlled the events which occurred in it. *Tu coo pop*, lit., "for the rolling up of Pop," which was the first month in the Maya year. *Holom* is an archaic future from *hul*; this form in *om* is mentioned by Buenaventura, *Arte de la Lengua Maya*, 1684, and is frequent in the sacred language, but does not occur elsewhere. *Tucal ya*, on account of his love; but *ya* means also "suffering," "wound," and "strength," and there is no clue which of these significations is meant. *Ahkinob*; the original has *tukinob*, which I suspect is an error; it would alter the phrase to mean "In that day there are fathers" or lords, the word *yum*, father, being constantly used for lord or ruler. The *ahkin* was the priest; the *ahbobat* was a diviner or prophet. The 9th Ahau Katun was the period of 20 years which began in 1541, according to most native authors, but according to Landa's reckoning in the year 1561.

<sup>2</sup> In quoting and explaining Maya words and phrases in this article, I have in all instances followed the *Diccionario Maya-Español del Convento de Motul* (Yucatan); a copy of which in manuscript (one of the only two in existence) is in my possession. It was composed about 1580. The still older Maya dictionary of Father Villalpando, printed in Mexico in 1571, is yet in existence in one or two copies, but I have never seen it.



This Codex corresponds in size, appearance, and manner of folding to the descriptions of the Maya books which I have presented above from Spanish sources. It has thirty-nine leaves, thirty-five of which are colored and inscribed on both sides, and four on one side only, so that there are only seventy-four pages of matter. The total length of the sheet is 3.5 meters, and the height of each page is 0.295 meter, the width 0.085 meter.

The first publication of any portion of this Codex was by Alexander von Humboldt, who had five pages of it copied for his work, *Vues des Cordillères et Monumens des Peuples Indigènes de l'Amérique*, issued at Paris in 1813 (not 1810, as the title-page has it). It was next very carefully copied in full by the Italian artist, Agostino Aglio, for the third volume of Lord Kingsborough's great work on *Mexican Antiquities*, the first volume of which appeared in 1831.

From Kingsborough's work a few pages of the Codex have been from time to time republished in other books, which call for no special mention.

Two pages were copied from the original in 1855, and appeared in Wuttke's *Geschichte der Schrift*, Leipzig, 1872.

Finally, in 1880, the whole was very admirably chromo-photographed by A. Naumann's establishment at Leipzig to the number of fifty copies, forty of which were placed on sale. It is the first work which was ever published in chromo-photography, and has, therefore, a high scientific as well as antiquarian interest.

The editor was Dr. E. Förstemann, aulic counselor and librarian-in-chief of the Royal Library. He wrote an introduction (17 pp. 4to) giving a history of the manuscript, and bibliographical and other notes upon it of much value. One opinion he defends must not be passed by in silence. It is that the Dresden Codex is not one but parts of two original manuscripts written by different hands.

It appears that it has always been in two unequal fragments, which all previous writers have attributed to an accidental injury to the original. Dr. Förstemann gives a number of reasons for believing that this is not the correct explanation, but that we have here portions of two different books, having general similarity but also many points of diversity.

This separation led to an erroneous (or perhaps erroneous) sequence of

the pages in Kingsborough's edition. The artist Aglio took first one fragment and copied both sides, and then proceeded to the next one; and it is not certain that in either case he begins with the first page in the original order of the book.

*The Codex Peresianus*, or *Codex Mexicanus*, No. II, of the *Bibliothèque Nationale* of Paris.—This fragment—for it is unfortunately nothing more—was discovered in 1859 by Prof. Leon de Rosny among a mass of old papers in the National Library. It consists of eleven leaves, twenty-two pages, each 9 inches long and  $5\frac{1}{4}$  inches wide. The writing is very much defaced, but was evidently of a highly artistic character, probably the most so of any manuscript known. It unquestionably belongs to the Maya manuscripts.

Its origin is unknown. The papers in which it was wrapped bore the name "Perez," in a Spanish hand of the seventeenth century, and hence the name "Peresianus" was given it. By order of the Minister of Public Instruction ten photographic copies of this Codex, without reduction, were prepared for the use of scholars. None of them was placed on sale, and so far as I know the only one which has found its way to the United States is that in my own library. An ordinary lithographic reproduction was given in the *Archives paléographiques de l'Orient et de l'Amérique*, tome i (Paris, 1869-'71).

*The Codex Tro*, or *Troano*.—The publication of this valuable Codex we owe to the enthusiasm of the Abbé Brasseur (de Bourbourg). On his return from Yucatan in 1864 he visited Madrid, and found this Manuscript in the possession of Don Juan de Tro y Ortolano, professor of paleography, and himself a descendant of Hernan Cortes. The abbé named it *Troano*, as a compound of the two names of its former owner; but later writers often content themselves by referring to it simply as the *Codex Tro*.

It consists of thirty-five leaves and seventy pages, each of which is larger than a page of the Dresden Codex, but less than one of the *Codex Peresianus*. It was published by chromolithography at Paris, in 1869, prefaced by a study on the graphic system of the Mayas by the abbé, and an attempt at a translation. The reproduction, which was carried out under the efficient care of M. Leonce Angrand, is extremely accurate.

All three of these codices were written on paper manufactured from



the leaves of the maguey plant, such as that in common use in Mexico. In Maya the maguey is called *ci*, the varieties being distinguished by various prefixes. It grows luxuriantly in most parts of Yucatan, and although the favorite tipple of the ancient inhabitants was mead, they were not unacquainted with the intoxicating *pulque*, the liquor from the maguey, if we can judge from their word for a drunkard, *ci-vinic* (*vinic*=man). The old writers were probably in error when they spoke of the books being made of the barks of trees; or, at least, they were not all of that kind.

The above-mentioned three Manuscripts are the only ones which have been published. I shall not enumerate those which exist in private hands. So long as they are withheld from the examination of scientific men they can add nothing to the general stock of knowledge, and as statements about them are not verifiable it is useless to make any. I may merely say that there are two in Europe and two or three in Mexico, which, from the descriptions I have heard or read of them, I think are probably of Maya origin.

In addition to the Manuscripts, we have the mural paintings and inscriptions found at Palenque, Copan, Chichen Itza, and various ruined cities within the boundaries of the Maya-speaking races. There is no mistaking these inscriptions. They are unquestionably of the same character as the Manuscripts, although it is also easy to perceive variations, which are partly owing to the necessary differences in technique between painting and sculpture; partly, no doubt, to the separation of age and time.

Photographs and "squeezes" have reproduced many of these inscriptions with entire fidelity. We can also depend upon the accurate pencil of Catherwood, whose delineations have never been equalled. But the pictures of Waldeck and some other travelers do not deserve any confidence, and should not be quoted in a discussion of the subject.

Both in the inscriptions, manuscripts, and paintings the forms of the letters are rounded, and a row of them presents the outlines of a number of pebbles cut in two. Hence the system of writing has been called "calculiform," from *calculus*, a pebble. The expression has been criticised, but I agree with Dr. Förstemann in thinking it a very appropriate one. It was suggested, I believe, by the Abbé Brasseur (de Bourbourg).



## 5.—EFFORTS AT INTERPRETATION.

The study of the Maya hieroglyphic system is still in its infancy. It is only two years since an unquestionably faithful reproduction of the Dresden Codex supplied a needed standard of comparison for the Codex Troano. Some knowledge of the Maya language, if not indispensable, is certainly desirable in such an undertaking, particularly if the writing is in any degree phonetic. But it was not till 1877 that any printed dictionary of that tongue could be had. The publication of the *Diccionario de la Lengua Maya* of Don Juan Pio Perez was completed in that year, and, though still leaving much to be desired, especially in reference to the ancient forms and meanings of words, it is a creditable monument of industry.

When the Abbé Brasseur edited the Codex Troano he also attempted an explanation of its contents. He went so far as to give an interlinear version of some pages, and wonderful work he made of it! But I am relieved of expressing an opinion as to his success by his own statement in a later work, that he had, by mistake, commenced at the end of the Codex instead of its beginning; that he had read the lines from right to left, when he should have read them from left to right; and that his translations were not intended for more than mere experiments.<sup>1</sup>

The attempt at a translation of the Dresden Codex by Mr. William Bollaert, published in the *Memoirs of the Anthropological Society of London*, 1870, may be passed over for the same reason. He also "read from the bottom upwards, and from right to left," and his renderings were altogether fanciful.

The first who addressed himself to an investigation of the Maya hieroglyphics with anything like a scientific method was M. Hyacinthe de Charencey, of France. I append, in a note, a list of his essays on this subject, with their dates, so far as I know them.<sup>2</sup> When they first appeared

<sup>1</sup> Brasseur de Bourbourg, *Bibliothèque Mexico-Guatémaliennne, précédée d'un Coup d'Œil sur les Études Américaines*, p. xxvii, note (Paris, 1871).

<sup>2</sup> Hyacinthe de Charencey, *Essai de Déchiffrement d'un fragment d'inscription Palenquène*, in the *Actes de la Société Philologique*, mars 1870.

*Essai de Déchiffrement d'un fragment du Manuscrit Troano*, in the *Revue de Philologie et d'Ethnographie*, Paris, 1875.

The above two were republished under the title: *Études de Paleographie Américaine; Déchiffrement des Écritures Calculiformes ou Mayas*.

*Recherches sur le Codex Troano*, Paris, Ernest Leroux, éditeur, 1876, 8vo., p. 16.

I translated the results, and gave them to the public in this country in the same year (1870), together with a copy of the alphabet of Landa,<sup>1</sup> which was the earliest notice of the subject which appeared in the United States.

The conclusion which M. de Charencey reached was that the Codex Troano is "largely made up of combinations of numerals and reckonings more or less complicated, either astronomical or astrological, the precise purpose of which it were as yet premature to state." He especially addressed himself to the Plates VIII to XIII, and showed by diagrams the arrangement in them of the signs of the days, and the probability that this arrangement was taken from a "wheel," such as we know the Mayas were accustomed to use in adjusting their calendar.

An ingenious and suggestive analysis of Landa's alphabet and of various figures in the Dresden and Troano Codices was carried out by Dr. Harrison Allen, professor of comparative anatomy in the University of Pennsylvania. It was published in 1875, in the *Transactions of the American Philosophical Society*.

In the following year (1876) appeared the first part of Prof. Leon de Rosny's *Essai sur le Déchiffrement de l'Écriture Hiératique de l'Amérique Centrale*, folio. The second part was published shortly afterward, but the third part not till some years later. Professor de Rosny has collected many facts which throw a side light on the questions he discusses. He points out that the signs are to be read from left to right; he gives a valuable list of variants of the same sign as it appears in different manuscripts; and he distinguishes the signs of the cardinal points, although it is doubtful whether he assigns to each its correct value. He has also offered strong evidence to fix the phonetic value of some characters. Altogether, his work ranks as the most thorough and fruitful which has heretofore been done in this field.

In 1879 Prof. Charles Rau published, through the Smithsonian Institution, his work, "The Palenque Tablet in the United States National Museum, Washington." Its fifth chapter is devoted to the "aboriginal writing in Mexico, Yucatan, and Central America," and offers a judicious summary of what had been accomplished up to that date. He defends the position,

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<sup>1</sup> The Ancient Phonetic Alphabet of Yucatan. By D. G. Brinton, M. D. New York, J. Sabin & Sons, 1870, 8vo., p. 8.



which I think is unquestionably the correct one, that the Maya writing is certainly something more than systematized picture-writing, and yet that we cannot expect to find in it anything corresponding to our own alphabet.

In the same year (1879) Dr. Carl Schultz-Sellack published in the *Zeitschrift für Ethnologie*, Bd., XI, the results of some studies he had made of the Dresden Codex, compared with others published in Kingsborough's work, especially with reference to the signs of the gods of the cardinal points. He recognized the same signs as De Rosny, but arranged them differently. Many of his comparisons of Maya with Aztec pictographs are suggestive and merit attentive consideration; but he speaks a great deal too confidently of their supposed close relationship.<sup>1</sup>

Although Dr. Förstemann, in his introductory text to the Dresden Codex (1880), expressly disclaims any intention to set up as an expounder of its contents, he nevertheless compared carefully the three published codices, and offers (pp. 15-17) a number of acute suggestions and striking comparisons, which the future student must by no means overlook.

Finally, the "Studies in American Picture-Writing" of Prof. Edward S. Holden, published in the "First Annual Report of the Bureau of Ethnology, 1881," are to be included in the list. He devotes his attention principally to the mural inscriptions, and only incidentally to the Manuscripts. The method he adopts is the mathematical one employed in unriddling cryptography. By its application he is convinced that the writing is from left to right, and from above downward; that the signs used at Copan and Palenque were the same, and had the same meaning; that in proper names, at least, the picture-writing was not phonetic; and that in all probability it had no phonetic elements in it whatever.

As Professor Holden states that he is entirely unacquainted with the Maya language, and but slightly with the literature of the subject; as his method would confessedly not apply to the characters, if phonetic, without a knowledge of the Maya; and as he assumes throughout his article that the mythology and attributes of the Maya divinities were the same as those of the Aztec, for which the evidence is very far from sufficient, we must

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<sup>1</sup>Dr. Schultz-Sellack's article is entitled "*Die Amerikanischen Götter der Vier Weltgegenden und ihre Tempel in Palenque.*"



place his attempt at decipherment along with others which have failed through an inadequate grasp of the factors of the problem. Nevertheless, his attentive study of the relative positions of the signs have yielded results which will merit the thanks of future students.

