

THE ORIGIN OF THE PALEOLITHIC MEANDER*

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This work will contribute some material to the comparative studies of American and European primitive art, for it analyzes the ancient pattern of the meander ornament found in the Paleolithic settlement Mezine¹ in the years 1909-1916. This settlement existed before the maximum of the second advance of Wuerm glaciation. The German geological school of Professor W. Soergel² gives the age of advance of W2 at about the 70th millenary before our era.

Interested in the origin of Paleolithic meander ornament, I have studied it in other cultures of European prehistory, the Neolithic and Eolithic periods, and worked out a terminology for my studies; I propose to use the term "rhythmographic" for such a complex of primitive art. This includes not only the "meander" ornament, but the spiral, the so-called endless pattern, geometric ornament and others, which were named by different researchers at different times. I consider the rhythmographic a separate branch of primitive art, younger than sculpture but older than ideographic gravure, the European development period of which occurs at the time of interstadial W2 — W3 and of W3.

The Mezine settlement has provided sufficient material not only for a discussion of the origin of the meander ornament, but also for an understanding of the stages of the preceding evolution. Based on this material the following picture of the evolution preceding the appearance of the Mezine meander is revealed.

In examining the fragments of various bones which were treated by scrapers, rather than by chisels, we always notice many shallow lines on the bone. They are not haphazardly arranged, running in different directions, but are more or less well ordered. It is obvious

* This article is an abridgment of part of the author's monograph on the Paleolithic settlement near the village of Mezine in the northern Ukraine.

¹ E. A. Golomshtok, "The Old Stone Age in European Russia," *Amer. Philosoph. Society, New Series, Volume XXIX, Part II, March, 1938, Philadelphia, 1938, pp. 335-355.*

² W. Soergel, *Loesse, Eiszeiten und Paläolithische Kulturen*, Iena, 1919.

that a man holding a bone before him had scraped it many times in one direction and then in a different direction at a certain acute angle in relation to the preceding. No one would believe that this scraping had an esthetic aim. But in some places on finished, i.e., perfect Mezine specimens, we see similar lines ordered to such a degree that we must conclude that we have before us a primitive ornament; namely, incisions intended to arouse esthetic emotions in a spectator. The specimen represented on Table I, Fig. I, shows on its upper part little engraved figures. According to such authoritative experts of the West European Paleolithic Age as Abb. H. Breuil³ and E. Cartailhac, it represents the deformed figure of a woman. On the upper part of the figure there is an indecipherable engraving probably of ideographic content. In the middle of the figurine we notice an area of more or less triangular shape with rounded corners, circumscribed by a line; separate areas are shaded with still better ordered lines. The lines are of two types of more or less identical length and depth and at an equal distance from one another. Lines of one type cross lines of the other type at an angle of slightly less than 90°. These lines do not represent an ornament, however. In the opinion of researchers, this indicates the hairy cover of the genital triangle and, similarly, in the upper part they indicate a woman's hair. Similar lines but still better ordered are apparent on many Paleolithic spears. These are cut on the flat sides of the chisel-like points which fit into the lance. Undoubtedly, these lines were not visible since they were covered with resin, inserted in wood and then tied around. Similarly, short deep lines had been incised, not for decoration but with a utilitarian purpose, on the fragment of a mammoth rib found in the Paleolithic camp near Predmost in Moravia. This fragment⁴ had served as a file to smooth out certain soft materials — perhaps animal skins. The bone was polished and shined by constant use. We can observe a very important phenomenon on it.

³ N. Abb. Breuil, "Les subdivisions du paléolithique supérieur et leurs significations," *Congr. Inter. d'Anthropologie et d'Archéologie préhistoriques*, Compte Rendue de XIV session, Genève, 1912.

⁴ Dr. Martin Kříž, *Výrobky diluvialního člověka z Predmosti*, Pravek, 1903, No. 2, Tabl. III, Fig. 1a.

Here, Table I, Fig. 2, there are incisions of two types, which were made to roughen the surface of a smooth bone. The lines are inclined in different directions but do not cross each other. They do not give the impression of a chess board, but they proceed by vertical, downward columns and the columns of the different types alternate. This incised bone is especially instructive for *lines of one type had been made deeper than the lines of the other type*. The difference in their depth is so great that, in applying this bone as a smoothing tool, lines of one type, which inclined from the right side downward to the left side, had been almost entirely smoothed out in some spots and, in some printed reproductions of this tool, instead of lines there are white spots. I went to Brno where this bone is located to study it and discovered that under a magnifying glass and under oblique light the lines were still visible.

We see, therefore, that on the specimens previously examined, the artist, while removing the unnecessary smoothness and without esthetic intention, cut the columns of incisions in a regular, rhythmical way. The incisions of the columns are always inclined toward the opposite side in relation to the lines of the neighboring columns. They always form an angle of less than 90° and, in most cases, the angle is 60° . On the last specimen, in trying to make the surface of the bone as coarse as possible, the artist put the columns of incisions one besides the other. Obviously, the roughness of a bone so incised is no less than that obtained by the older method, but the process of incision is much easier since it only required half the work that would have been needed in the crossed incision method. Such a method is widely used on the Mezine objects, but here we must admit a decorative purpose since the incisions are made on objects that can in no way be classified as working tools. The thin, narrow plates of the mammoth tusk with the little orifice at one end, used evidently as pendants, are decorated at the most with two such columns of incisions, which are inclined in different directions. They are only decorated on one side (Table I, Fig. 3). Wider plates for the same purpose carry three columns of incisions (Table I, Fig. 4) and some of the figures shown on Table I, Fig. 1 are sometimes abundantly covered on their convex back with

columns of incisions, reminding one of the engraved bone of Predmost (Table I, Fig. 2). In examining the number of lines in neighboring columns, we are convinced that the artist was not interested in his work. He did not try to make every line in one column correspond to the line in the other column. The artist did not yet have an idea of the so-called chevron or "*dent de loup*." The incisions in the columns are cut without any thought of the incisions in the neighboring columns, and we have an impression of chevrons or zigzags only because the incisions of one column obey the same rhythm as the preceding. But on some specimens, as shown on Table I, Fig. 4 and 6, the lines are lengthened so that they begin to reach the incisions of neighboring columns and, sometimes, for instance on the pendant, Table I, Fig. 4, one incision was joined to the other, forming a chevron, but the preceding or the following incision of the same column was not joined to its neighbor. Finally there are specimens which show that the artist already understood the idea of a chevron. The lines of neighboring columns are joined and, if there are two such columns, we have to deal with chevrons and, if there are several of them, we have a specimen with regular zigzag-like lines (Table I, Fig. 6 and 7). We observe in Mezine art the same phenomenon as in Predmost art, viz., the lines in adjoining columns are not of identical value; on one object the lines incline from the left downward to the right and are steeper than the lines which incline in the opposite direction. This indicates that the incisions were made by a right-handed artist. On some objects other lines are incised better and it is obvious that the master was left-handed. That incisions were made by a right-handed master is obvious from the specimen on Table I, Fig. 4. It was easier for the master to engrave the columns at the edges for there are two of them and, besides, every line goes downward steeper and, therefore, the columns occupy a narrower place than the column in the middle, which is formed of the lines inclined to the other side and is less steep than the lines on the side columns. Another phenomenon of great importance is observed on these simple specimens of decorative art of Mezine, which is also familiar to Predmost art. In engraving incisions arranged in columns either with the right or left hand, the master was also constrained to engrave the end of

the object or all of the object, which he held before him. In the case of the longer object, which we find in Mezine, the master held the end of the object with one hand and probably rested the other end on something more or less stable. Then, after engraving the object to the spot where his hand prevented further engraving, he grasped the object at the end which had already been worked, that is, the engraved first half of the object, and proceeded with the engraving of the part not yet touched. Thus, the master used the axis of symmetry of the second order as it is called in crystallography (Table I, Fig. 8) in his work. While the lines did not form chevrons, new, entirely incomprehensible combinations of incisions appeared (Table I, Fig. 5) in the place where the incisions of one engraved phase met the next phase, which usually took place near the middle of the object. We do not know whether the master observed this. Another thing occurred when the Mezine artist found the regular "*dents de loup*" or chevrons. Now, using a 180° rotation, the artist obtained very definite forms which were previously unknown. He continually studied and explored them and, finally by rotating them at 180° , mastered their formation, that is, mastered the use of the *axis of symmetry of the second order*.

Let us examine a little more closely all possible combinations of chevrons which were chanced upon by the artist: those which appear to be a function of the axis of symmetry of the second order and let us see how he used them. The simplest combination and the one which occurs most frequently is the one shown on the diagram, Table I, Fig. 15. It is formed by the meeting of two columns of chevrons, one from above whose chevrons have vertexes directed downward and the other whose chevrons have vertexes directed upward. At the meeting of these two columns of chevrons, no single complete chevron reached the point of junction: *vertexes of the complete chevron never meet at one point*. However, the sides of truncated chevrons of the upper and the lower columns do meet consecutively at the junction line, forming vertical chevrons whose sides form an angle of about 120° . The number of such chevrons may vary, depending upon the area occupied by a column of incisions and the number of truncated chevrons whose

sides reached the line of junction. On the diagram (Table I, Fig. 15), only two chevrons were truncated by the horizontal line of junction where the two columns or the two systems of chevrons met. Their sections formed vertical chevrons on both sides of the horizontal, i.e., the initial chevrons of two opposite columns. Where such a combination of whole and truncated chevrons occurs on the ornament (Table I, Fig. 9), we noticed four complete chevrons on the upper half of the ornamented area, the vertexes of which are directed downward. On their sides there are a greater number of truncated chevrons which, with the truncated chevrons of the lower system, i.e. of the chevrons whose vertexes are directed upward, form the vertical chevrons with obtuse angles at the vertexes. On the lower half of the ornamented area (Table I, Fig. 9), we notice the vertex of only one complete chevron, since the entire lower part of this specimen had been greatly damaged. But we can assume that the number of complete chevrons was not less. On the object (Table I, Fig. 10) we notice the same combination on the lower part. Here, both on the upper and the lower part, two chevrons are formed whose vertexes are directed straight toward the place where the two systems meet. Here the chevrons of different columns are most contiguous and, as we have mentioned, in all similar combinations their vertexes do not join, but six or seven truncated chevrons, which are located on both their sides, have the corresponding sides joined and form six or seven vertical chevrons on both sides of the complete chevrons of the upper and lower systems.

Thus, in the meeting of the two systems or columns of chevrons, as described above, there can arise and actually does arise only one combination. If the columns of chevrons meet on the ornamented field and are arranged so that their vertexes point to the ends of the ornamented object, then entire series of combinations arise. The simplest one is shown on the fragment of a pendant (Table I, Fig. 8). At the meeting of two sides of the chevrons a figure of an inclined parallelogram is formed. These newly formed parallelograms are always inclined, since the chevrons are asymmetrical and their sides are always of unequal length, as was seen above, and since the apex of every chevron is formed by the joining of

two lines at an acute angle of about 60° . In some cases, on specimens made by right-handed artists, they appear as on the pendant (Table I, Fig. 8). Its diagram is on Table I, Fig. 13. The chisel of the left-handed artist produces the figures shown on the diagram of Table I, Fig. 14. On these diagrams the letter (a) marks the chevron's sides, which were easy for the artist to engrave. Since both masters made an identical angle of about 60° , the angles at which the sides of the opposite chevrons met equals approximately 120° . The angle of 60° at the vertex of the chevron was quite possibly determined by the structure of the hand. Certainly this is the maximum angle: the maximum amplitude of the hand's motion between its greatest movement, now in ventral, now in distal direction, in relation to the constant position of the forearm.

The meeting of the chevrons only produces two figures: the right and the left skewed parallelogram. This form did not attract the attention of the Mezine artists to any great degree and it represents only 18% of all the forms originated by joining the ends of the chevrons' sides. They paid greater attention to what we called the "meander whirl." In various forms it represents 82% of all the forms originating in the joining of the chevrons' sides. Apparently this attracted the artist's attention and created in him esthetic feelings and emotions. In fact, the discovery of such an essentially simple combination of chevrons, repeated according to the principle of the axis of symmetry of the second order, gave birth to one link, one "whirl" of that ornament that has dominated mankind's attention from the Paleolithic Age to our time. If one has to measure the importance of some tool in human culture by the length of time which it is used by mankind, the first place in the field of esthetic acquisitions should be given to the meander design and its history is the history of the most important part of human culture for many thousands of years.

This form emerged as one of many possible combinations when the object engraved with chevrons was rotated at 180° . This form of ornament is found in Mezine art in great quantities with various defects and various ways of correcting them and this supplies

us with much material for a detailed study of its origin. Most of the specimens are from the mammoth tusk bracelet, which was found in fragments scattered about a ten square meter area. This bracelet (Table I, Fig. 12), although it has only small parts missing, had been broken even before its completion. It is black and covered with dendrites; its engraving is clear, neither worn nor effaced by use as are some other specimens. Above all, we notice two narrow strips on it: one crossing it on the upper part on the border of the area covered with zigzags (b) and beneath with meander whirls (c); and the other on the lower part of the area covered with zigzags (d) and on the border of the area of the meander whirls (c). We see clearly that the union of the chevrons' sides, which point in opposite directions, was not effected by the artist either in the upper or the lower section. The presence of these stripes with their incomplete engravings shows clearly that all the complicated ornamental designs on this specimen had originated by the joining of such chevrons. The artist's mistakes clearly show that he had not mastered the technique of the meander whirl.

Before considering the ornament of this bracelet, let us examine the types of meander whirl found on these and other specimens of Mezine art.

Similar to the two skewed parallelograms on the right and on the left, we have meander whirls of two types. A right meander whirl (Table I, Fig. 16) arises when the chevrons of the upper and lower columns approach one another so closely that the *right* side of the lower chevron joins with the right side of the upper chevron. The process of creating the central figure of the meander whirl can be compared to the following: Let us imagine that two men go to meet each other with outstretched arms. They do not take each other's palms with their right hands, but, reaching higher, they grasp each other by the shoulder. Their right arms form one line while their outstretched left arms hang in the air. If behind each of these men other men stand with outstretched arms, the first two men can take another pair by their right arms with their free left arms. The other two men with their free left arms can do the same in relation to the third pair, etc. Such a

method of contact can take place among men and is only limited by the length of their arms. However, in the case of chevrons, this can be done indefinitely. The left meander whirl originates in this fashion. Only here (Table I, Fig. 17), the combination of the first pair of the adjoining chevrons is effected by fusing their left sides. We can conclude that the most elementary meander whirl is one formed by joining *two chevrons only*, i.e., every zigzag formed of three lines. In the case of a left meander whirl (Table I, Fig. 17), it is formed from a zigzag similar to a letter N. More complicated whirls would arise if we add one more chevron behind every first pair of chevrons joined in the zigzag. Thus, from the first single meander whirl we could obtain double, triple, and so on, indefinitely. The artist who ornamented the bracelet was right-handed. We are convinced of this after examining every meander whirl on the bracelet. In the upper part (a) two rows have six meander whirls with three in each row. Of them 1, 3, 4 and 5 are right ones; 2 is a left one; the sixth is an abnormal one, to which we shall return later. In the following area of meander whirls (c) there are 12, four rows of meander whirls with three in a row. The first of these rows has been damaged. Here, by an oversight, two parts which do not correspond have been joined. This is quite obvious upon closer examination of the sides of the chevrons. But in view of the fact that the central meander whirls, i.e., zigzags formed by three lines, are all joined beneath the crack, they can be accepted as right meander whirls. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 12 are right ones. The 11th forms a left one. In the lower part (e) there are only five meander whirls in two rows, the third one in the first row being so damaged that it is hard to make out. Of these five meander whirls, the right ones are 1, 4, 5. Two and three, together with the 6th meander whirl of the first section and the separate meander whirl on the object, Table I, Fig. 10, form a special group, which we must examine separately. These meander whirls can be either right or left, as is shown on the diagram Fig. 18 and 19, Table I. They have the following peculiarity: If an artist after engraving one column of chevrons, turned the object at 180° and started working on the opposite column, then toward the end he noticed that the last chevron was so located that by joining it to the nearest

chevron a parallelogram could be formed, but there was no more space to engrave a nearer chevron to create a meander whirl. Desiring to create, as elsewhere, a meander whirl, he sought a solution. In a similar meander whirl of the first area, the sixth one, and in the third meander whirl of the last area, we notice superfluous lines which indicate that the master may have tried to change the design. However the following solution was found: the parallelogram remained incomplete because the sides of chevrons were joined as in Table I, Fig 19. The artist united those sides that were to be joined if the chevrons were to be made closer to each other with additional lines. Such additional lines are very crudely sketched in Fig. 18 and 19. The artist joined the free sides of the chevrons with the sides of the following chevrons in a normal way. As a result, an entirely different meander whirl arises: not a triple-line zigzag but a complicated five-line figure. If in a normal case a triple-line middle meander whirl lies horizontally (Table I, Fig. 16 and 17), its corresponding figure lies in a *vertical position*. If the angles of the winding incisions, which correspond to the angles of the chevrons, were *acute*, then here they are complementary, 120° (180° minus 60°), i.e., obtuse. Such meander whirls are an anomaly in Mezine art. Although found in the ornaments of some specimens, they form only a small percentage. It is interesting to point out that, of all the ornamental figures created by joining the chevron sides, there are:

Horizontal right meander whirls (Table I, Fig. 16)	38%
Horizontal left meander whirls (Table I, Fig. 17)	21%
Vertical right meander whirls (Table I, Fig. 18)	5%
Vertical left meander whirls (Table I, Fig. 19)	18%

i.e., 43% of right, 39% of left, 59% of horizontal, and 23% of vertical.

These figures indicate that for Mezine art the *horizontal meander whirls* were the most characteristic and most widely used. Of these, the *right forms* were more common than the left. Assuming that these figures indicate to a certain degree the relative number of right-handed and left-handed masters, it is obvious that the artists who made right meander whirls had to use vertical forms of the meander whirls in 5% of the cases to save the situation. Those who made left designs had to use **them**

in 18% of the cases. Previously, we considered each element of Mezine ornament separately. But few specimens were decorated with one element only. These elements were largely found in combinations which formed the so-called "surface covering designs" or "endless designs." Even on the specimen of Table I, Fig. 10 there is one meander whirl on the upper two thirds of the ornamented area and on the third part, the lower one, we notice the beginning of a different meander whirl. A transition from one meander whirl to another is properly represented on the ornamental element shown in Table I, Fig. 9. In fact, here we have the lower part of one meander whirl above and the upper part of the other meander whirl below. This ornamental form (Fig. 9), schematically represented in Fig. 15, shows how, in complicated ornamental combinations both on the bracelet, Table I, Fig. 12, and on the ornament of the specimen shown in Table I, Fig. 11, there is effected the transition from one meander whirl to another, be it in vertical or horizontal direction. Such a form properly represents the parts of two adjoining meander whirls, which, in their entirety, lie higher or lower, right or left, depending upon the dotted lines — horizontal or vertical — which we shall place on this diagram and which we shall consider the border between two meander whirls. At the same time these dotted lines, which intersect and divide the ornamented area into four parts, can be considered as the lines that separate four meander whirls. These move in opposite directions from the point of intersection of the dotted lines along the diagonals. Table II, Fig. 3 represents in a somewhat altered form the middle of the bracelet of Table I, Fig. 12, marked there with "C"; the reason for the change will be given later on. In this figure the dotted lines are drawn through all the contact points of the incisions. These dotted lines do not form a continuous line but short segments. Sometimes these segments intersect in a normal way at one point. Sometimes they do not intersect, but four of them unite to create a small parallelogram and in its center there is located the little line, the middle of those that form our initial meander whirl. Here it is apparent how the entire complicated design is divided by these lines into little areas of incisions which were similarly placed. There are only two kinds of areas, five lines inclined from right downward to the left and six

lines inclined from the left downward to the right. A combination in the order, 6 and 5 lines directed downward and 5 and 6 directed upward, always has a parallelogram between areas with a single incision; a combination of the areas in this order: 5 and 6 downward and 6 and 5 upward, does not have any such little parallelogram. The first combination forms meander whirls while the second does not. If we isolate four areas of incisions in the design shown on Table II, Fig. 3, with the middle little incision included in the dotted parallelogram (Table II, Fig. 1), and examine how the incisions join, we shall see an interesting picture. Let us take for a starting point the end of the third incision on the upper boundary of the upper left area (a). Now let us consider how this incision combines with the end of the other incisions and the last one with another — and so on indefinitely, i.e., until this broken line passes out of the ornamental field in the lower boundary of the section (c). Reaching the place indicated by an arrow, the exit of this line, we realize that not all incisions in these four areas were joined. In each area we notice lines that do not belong to what we call the *meander whirl*. We cannot therefore call the entire area formed by our four areas of lines a, b, c, and d the meander whirl. We shall only designate by this term a *broken line that is formed by the joining of the incisions* and, following which, *we reach the territory of these four areas* and then again go out. The combination of these four areas we shall subsequently designate as the *ornamental field of the meander whirl*. There remain free lines at the corners of this field that do not belong to our meander whirl. On the ornament of the bracelet not all of its ornamental meander fields are formed by the same number of incisions, but some are and some are not connected by their sides to whole or truncated chevrons. The upper part of the ornamental meander field, shown in Table II, Fig. 2, is formed by three whole chevrons and three truncated, and the lower part by four whole and three truncated.

Following the broken line, as in the preceding field, we discover that this line goes out at a different place, a different boundary of the meander field. Having examined ornamental fields of the meander whirls of this bracelet (Table I, Fig. 12), we find that they are of different designs. Here, the artist did not fol-

low the law of axis of symmetry of the second order strictly and, having sketched at one end of an ornamental meander field three whole and three truncated chevrons, he did not proceed after having rotated the object at 180° to engrave the same number of whole and truncated chevrons. Thus, abandoning rhythm and symmetry, the artist created this design but we do not know in what order. Whatever starting point we accept on the ornamental line and in whatever direction we follow it, we will discover that it proceeds in intricate and incomprehensible directions whether winding or unwinding. We notice that some of the meander fields on the bracelet are symmetrical, i.e., two of their halves present an identical number of whole and truncated chevrons and that this amounts to three in the above-mentioned cases; we have sketched on Table II, Fig. 3 an ornament following its contour on the bracelet and the number of the ornamental meander fields. Evidently these symmetrically arranged ornamental fields of meander whirls permit every meander whirl to join another meander whirl of the meander fields that are located diagonally above or below them. If we have a great number of such fields on an ornamental surface, their meander whirls form entire rows. Their position on the ornamental surface depends on whether the whirls are right or left ones and on the number of whole or truncated chevrons which enter the design of the field. The master, who engraved the specimen shown in Table I, Fig. 11, had fully realized this. Here, as we can see, an ornament was combined with the ornament of the meander fields embracing two whole and two truncated chevrons and rotated strictly according to the law of axis symmetry of the second order; the meander whirls here, therefore, form a regular series which incline in an opposite direction to that on the bracelet. We must next investigate the following: in what way and by what method did the Mezine artist connect the various ornamental fields of the meander whirl on the objects which he engraved. Here again the bracelet ornament gives an answer. Whether on simple designs of the Mezine ornament or on columns of incisions or, later, on the columns of chevrons, the artist always followed certain rules, moved initially by the nature of things and perhaps later by habit which became the lawgiver of art. The artist engraved the lines inclined in one or another direction

on all longer objects and always arranged them in vertical columns parallel to the longer axis of the piece. If there were several such columns (with a subsequent evolution, they gave rise to chevrons), they were likewise orientated on a longer specimen. If by gradually joining the sides of the adjacent chevrons the zigzag lines are formed, they lie naturally across the longer axis, i.e., parallel to the shorter axis of the object — if the term “parallel” can be applied to a zigzag line in its relation to a direct line. Here, we notice that the zigzag lines are not identical (some of them incline to the side favored by the artist, some are steeper, that is, carved deeper than others), and that the general direction of the zigzag line cannot run parallel to the transversal axis of the object. It always deviates from it upward or downward according to the individual artist, although not too noticeably. Therefore, after having engraved an ornamental field of the meander whirl, the only one the artist is able to handle (Table II, Fig. 5), he would engrave another and similar field near it, then a third one — in such a way that a new ornamental field is located in relation to the first one, not side by side, but where the axis of symmetry of the second order drawn through a point lying on the boundary between the first ornamental field and an adjacent field required it, i.e., just in the middle between the ends of the sides of the whole chevrons on this boundary. The resultant connection of two ornamental fields permits the building of new ornamental fields of meander whirls both above and below them at the place of their junction; every two adjacent areas of connected ornamental fields both above and below form such a truncated combination, one whole chevron and the side of the smallest chevron. It remains only to add one side of the smallest chevron (we have represented it diagrammatically in Table II, Fig. 6), and then to turn the entire ornamental field at 180° and add where necessary the whole and truncated chevrons which are lacking. A design could be prolonged endlessly by repeating such rotations and adding the sides of whole and truncated chevrons. The same could be done with less effort and more mechanically by another method: by engraving several meander fields (a) near one another, one could engrave below all of them a similar meander field according to the same principle that was

presented in the preceding case, i.e., according to the law of the axis of symmetry of second order. It would be an application of the ornamental pattern which we see on the specimen (Table I, Fig. 9) and on the diagram of Table I, Fig. 15. If under every ornamental field (Table II, Fig. 7) a similar row of new ornamental fields (b) is made, we will obtain the form that must have surprised the Paleolithic master still more than it surprises us. After engraving six ornamental meander fields and examining them, we discover that there are eight rather than six (c). We just have to add an incision at the center of each meander whirl which was unexpectedly formed. Perhaps at this stage of development of Mezine art there arose both in master and spectator, not only a feeling of esthetic delight occasioned by the lines symmetrically arranged, but something more. Certain designs formed ornamental fields of meander whirls which resulted in inclined rows. These unexpectedly at first and perhaps unnoticed by the artist, gave birth to some primitive artistic feelings. Regularity in arrangement of incisions, the preservation of regular rhythmic arrangement of chevrons and obedience to the axis of symmetry of second order, were stronger than his own wish. For instance, we notice on one specimen (Table II, Fig. 8) the artist's effort to engrave an isolated row of meander whirls. Examining it, we realize the artist's obvious failure to do it. The artist has to obey the laws of rhythm and symmetry; he is powerless to dominate them. He is able to arrange meander whirls only according to the same inclined and almost diagonally preceding pattern, i.e. automatically in an endless design. In general, there are no such rows of meander whirls in Mezine art such as we would now engrave, i.e., parallel to one of the edges of the object we would like to decorate.

At this stage the sense of the Mezine designs is interrupted. We do not know what was achieved in the Paleolithic Age in this domain of its artistic or, perhaps, exploratory activity. We do not have any Paleolithic material related to the further evolution, either from neighboring or far-off regions. The difference between known designs of the spiral of the Paleolithic settlement, Arudy⁵,

⁵ Breuil, *op. cit.*, Fig. 263.

in France (younger than Mezine) and the Mezine designs, is so great that it is too early, because of the absence of intermediate links, to discuss the matter.

Summing up all we have learned from the Mezine material, we find that we have obtained considerable knowledge. In the first place this material clears the ground for a study of this branch of decorative art. We have discovered that the creation of a row of meander whirls is not necessarily connected with the classical Mediterranean world. True enough, in the classical cultures of ancient Greece and Rome we have to deal with horizontally arranged rows of meander whirls, but this does not change the situation. Explorations in the domain of classical decorative art have not given any satisfactory answer as to the origin of this type of ornament, while Mezine has in the highest degree. If, instructed by a Mezine master, we began to engrave ornamental fields of meander whirls with a greater or smaller number of whole and truncated chevrons than in Mezine art, we would have obtained not only all the known forms of meander whirls, but also some that had never been made before. It is a certainty that *meander is older than spiral*, and, therefore, the prejudice held by art historians that the meander originated from the spiral, which reacted unfavorably upon the study of art of other epochs and peoples, is finally eliminated. But the most important result is that Mezine art has shown that it originated as a *completely independent branch*. This art does not imitate anything in its designs, nor does it express any idea. However it shows in graphic form the understanding or feeling of rhythm and form among Paleolithic men and how they had become *acquainted with the axis of symmetry of second order as the first element of symmetry*. Our exploration of the Mezine art has shown that much of what we have conceived as the independent phenomena of decorative art has to be understood differently. As we have seen, meander designs are closely connected with the so-called "endless patterns" and were separated from them only later.

Thus, we can say that Mezine artistic designs have shown us the beginnings of a *new, hitherto unknown art in the history of our culture*. In this field mankind has created or discovered various forms of rhythm and symmetry. Properly speak-

ing, mankind even in the Paleolithic Age had the *beginnings of pure art*, where rhythm and symmetry existed in a most naked form with no concealed accessories. Assuming that there can be no real art without the design, rhythm and symmetry characteristic of it, the Mezine graphics are representative of this art in its purest form. Insofar as symmetry is essentially a notion connected with rhythm, whether dynamically or statically, and means a connection of rhythmical phenomena with certain planes or axis in space and lines and points on a surface as their projections, it would be proper to designate this independent art by a short term "rhythmographics." This art is akin to music; poetic meter is also close to it. Like this art, it uses two elements, longer or shorter sounds, while our art uses shorter incisions, more convenient to engrave, and longer, less convenient. It seems to me it is still closer to the dance. In fact, in the beginning it is the dance of a hand upon a smooth surface—a hand armed with a chisel—in order to eliminate (by only two kinds of incisions) unwanted or obnoxious smoothness of a tool. Then, subsequently, there arises a play, an amusement, a sport. As a competition, as a struggle for recognition from the spectators, new explorations in this field started. It is not surprising that this type of the Paleolithic art has remained unsurpassed and captivates spectators from all parts of the world. Even modern architects of the greatest centers of culture apply it.

TABLE I

1. Woman's figure (?) made of ivory*	Mezine, Ukraine
2. Bone tool made from mammoth's rib	Predmost, Moravia**
3. Segment of ivory pendant	Mezine, Ukraine
4. Segment of ivory pendant	" "
5. Ornament on an object of unknown purpose	" "
6. Segment of an ivory object	" "
7. Object of unknown purpose	" "
8. Segment of an ivory pendant.	" "
9. Ivory object of unknown purpose	" "
10. Ivory object of unknown purpose	" "
11. Ivory object of unknown purpose	" "
12. Ivory bracelet	" "
13. Diagram of right parallelogram***	
14. Diagram of left parallelogram	
15. Diagram of intermeander ornamental field	

* All these designs of the Mezine bone object have been prepared in the Th. Volkov Anthropological Laboratory at the Ukrainian Academy of Sciences in Kiev.

** Križ, Martin, Dr., *Vyrobky diluvialního člověka z Predmostí*, Pravek, 1903, No. 2, Table III, Fig. 1a.

*** All drawings have been made by the author.

16. Diagram of ornamental field of right horizontal meander whirl
17. Diagram of ornamental field of left horizontal meander whirl
18. Diagram of ornamental field of right vertical meander whirl
19. Diagram of ornamental field of left vertical meander whirl

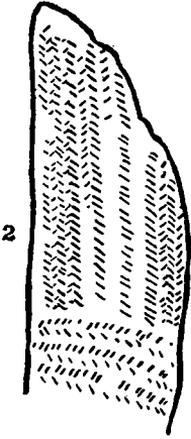
TABLE II

1. Diagram of the regular ornamental field of the right meander whirl (three complete and three truncated chevrons).
2. Diagram of the irregular ornamental field of the right meander whirl.
3. Part of the bracelet ornament which had been straightened out. Here, all the ornamental fields of the meander whirls are regular.
4. Diagram of the regular ornamental field of the left meander whirl (two complete and two truncated chevrons).
5. Three regular ornamental fields of the left meander whirls arranged one beside the other.
6. Three regular ornamental fields of the left meander whirls enlarged beneath by three similar fields. Each field has one incision added to it.
7. Three regular ornamental fields of the left meander whirls (a) with three identical ornamental fields at the bottom (b). Along the meeting line of these two ornamental fields, new ornamental fields are formed (c). One has to add the central incision to each of them in order to complete them.
8. Wedge from the mammoth's fang on which an attempt was made to design an isolated series of meander whirls. This object must be held in a vertical position.

TABLE I.



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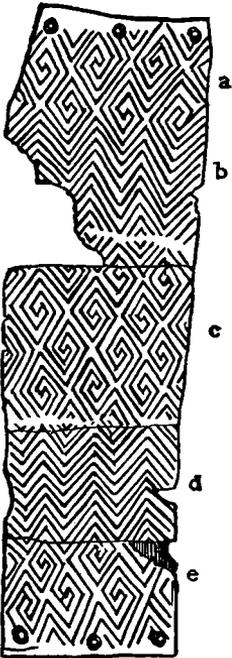
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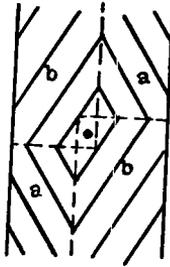
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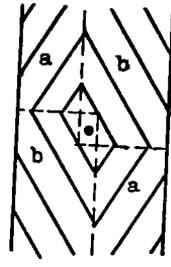
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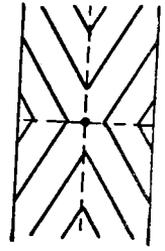
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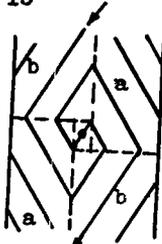
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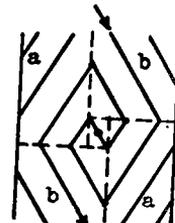
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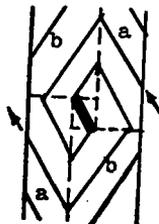
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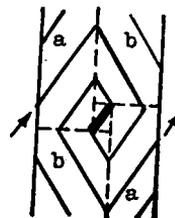
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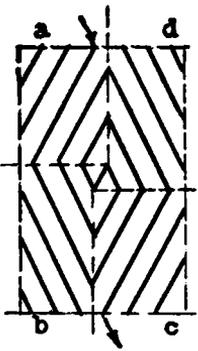


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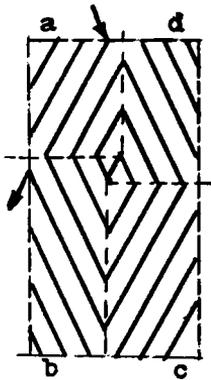


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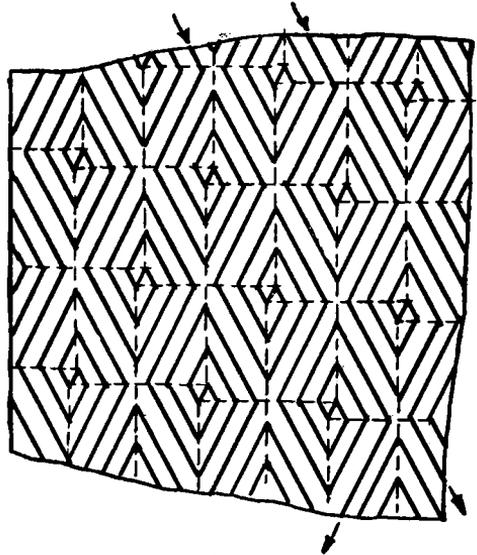
T A B L E II.



1



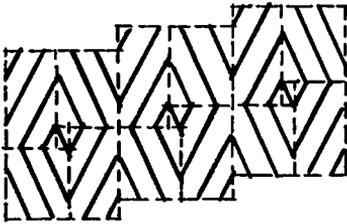
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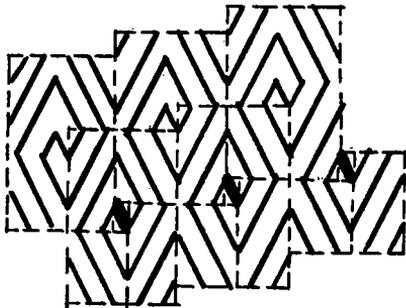
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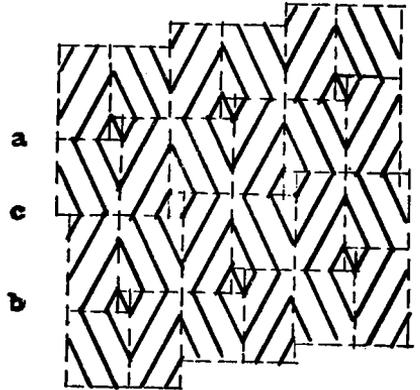
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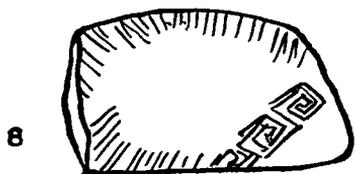
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