



THE PRELIMINARY RESULTS OF EXPERIMENTS WITH AURIGNACIAN SPLIT BASED POINTS PRODUCTION, HAFTING AND USAGE

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ABSTRACT

The proposed reconstructions of Aurignacian split based points production and hafting are based on the use of mechanical properties of wet deer antler -bending strength, elasticity and longitudinal fibrous. The efficient production of split is possible with two relative methods (or so-called "split drive technology") when the final reception of "tongued piece" and only snapped fragments are available. Both methods are based on the gentle bending of antler blank in the place of transversal slot which is carried out with "baton perces" or even fingers. The additional control of direction and spread of crack through body of antler is possible with some kinds of wedge-like lever (first of all fore-part of wood shaft, special antler chisels and wedges or even other tongued pieces).

The reconstructed method of hafting is attached with above-mentioned technology of their production. The flat wedge-shaped wood foreshaft of projectile is driven in split based point between the wet "winds". The latter is bound over wet sinew which efficiently fixed point on the shaft just after the dry of both. Perhaps, the sinew binding also was used for fixation of Aurignacian microliths on the surface of antler point in flat position as scale-like barbs.

The proposed hypothesis also explains some archeological data both unfinished or damaged points and different wastes of points production from archaeological assemblages)

KEY WORDS

Upper Paleolithic, Aurignacian, split based points, technology.

INTRODUCTION

The most ancient split based points were found in Early Aurignacian deposits of Upper Paleolithic sites El Castillo (Spain) and Istallosko (Hungary) which were dated more than 40 thousands years ago. The most intensive use of ones in Western and Central Europe took place between 34.000 and 29.000 b.p. (HAHN, 1988, p. 1-5; KNECHT, 1993). The certain similar points with splitted base were found also in Aurignacian levels of Kebara and El Quseir (Levant) on the Near East and Szeletian one of Szeleta site in Hungary (KNECHT, 1993, p. 142). The production and use of split based points in Europe was stopped near 22 thousands years ago (HAHN, 1988, fig. 2).

Contrary to other Early Upper Paleolithic industries of Europe (Uluzzian, Chatelperronian, Szeletian, Streleccian etc.) assemblage of bone-antler tools of Early Aurignacian is much more complicated and developed and with the exception of above-mentioned points includes different chisels,

wedges, lissoirs, awls, "baton perces" (fig. 5), true tongued pieces and ones with spitted base (fig. 1, 12, 13; 3, 3, 4, 9, 11), simple snapped and also splinted fragments (fig. 3, 10, 12) etc. (LEROU-PROST, 1975, 1979; HAHN, 1977; KNECHT, 1993). However just split based points are prime and "directive fossils" of some stages of European Aurignacian.

That is why the morphological peculiarities and varieties of ones are well discribed in current literature (LEROY-PROST, 1978, p. 116-120; HAHN, 1988). There are flattened drop-or even rhombic-shaped points which at the whole have 5-15 cm long and 0,7-2,2 cm width (fig. 1, 1-11; 2, 8-11). At the same time both longer and very small specimens (fig. 2, 1317) only 3-2,2 cm long (e. g. in assemblage of Istallosko) are presented too (VERTES, 1955, p. 111-131).

The choice of just antler as main raw material for split based points production (more than 97 % of studied specimens) was well explained by H. Knecht (1993, p. 139-142). It was connected with mechanical properties of one -increased elasticity and

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viscous better adapted for both splitting, wedging and hafting technologies of Aurignacian than bone or ivory.

On the other hand the problem of split based points production and hafting is still discussed in current literature since the time of first D. Peyrony's hypothesis of their manufacture. According to latter the split was produced by splinning in place of two previous transversal slots (fig. 2, 1) on the base of point (PEYRONY, 1935, p. 418-443). The specific antler "tools" or so-called tongued pieces found in some Aurignacian assemblages (fig. 1, 12, 13; 3, 3, 4, 11) were explained as direct wastes of this process. The aforementioned reconstruction at the whole was wide supported by {larger body of prehistorians (e.g. DELAGE, 1938, p. 3-25; VEZIAN and VEZIAN, 1966, p. 93-129; HAHN, 1988, p. 13-14).

For example according to reconstruction of latter (HAHN, 1988, fig. 7) the shaping of splitted base was carried out by successive bending in the place of two side grooves until to snapping off the distal part of blank only on final stage of point production (fig. 2, 2). The last author also proposed two possible versions of these points fixation in fore-shaft of projectiles when wedge-shaped fore-shaft was inserted between winds of base of point or latter was held in slot of shaft (fig. 2, 3). During discussion of proposed method of hafting he noted that in first method the fragile winds would have broken easily and wedge-shaped foreshaft may have held on whole depth of split. The second method was defined as more reliable because flexible winds of points were held and safed in deep slot of foreshaft.

On the other hand hypothesis of D. Peyrony practically at once became object of criticism too. So Dr. Henry-Martin explained absence of any tongued pieces among numerous split based points in assemblage of La Quina by the direct cleavage of their bases with bone or antler wedges (HENRY-MARTIN, 1930, p. 36-37). Among some modern scientists both these reconstructions with removal of tongued pieces and simple cleavage are supported (LEROY-PROST, 1975, p. 110-111; NEWCOMER, 1977, p. 299-300). It is notable, that latter author also confirmed ones experimentally, when beneficial mechanical

properties of wet antler (firts of all flexibility) were used. However the simple cleavage of wet antler blank was carried out by M. Newcomer with flint blade and hammer. According to "Peyrony's method" the antler blank was gently bent in place of 1 mm transversal incision with fingers for stimulation of longitudinal crack. The blade can be forced in transversal incision and used for help to start the crack too. When the first crack was started, the same operation is carried out on the inner side of blank and then both are carefully deepened by bending of future tongued piece up and down until latter breaks out. The split also can be continued by foring of "winds" of future point appart if tongued piece was removed prematurely. At the same time M. Newcomer (1977, p. 299) indicates that direct cleavade of antler blank is much more simple way to receive split based point that wiyh latter method.

However larger part of aforementioned reconstructions concerned with both manufacture and hafting of split based points as well as origin of tongued pieces were rejected in the recent and most detailed article of H. Knecht (1993, p. 142-146 etc.). The "Peyrony's method" (named as "technology of splinning") was defined as totally erroneous. Her most convincing argument against such reconstructions of production was connected with investigation of interior surfaces of splits. The latter on some archeological points and blanks are negative impresions of one another (fig. 3, 1). She noted also that tongued pieces are found only in some Aurignacian sites where split based points are presented and dimentions of their "tongues" and "splits" are not actually correspond to one another even in the same assemblages.

The latter author contrary to some mentioned above reconstructions also proposed other and more simple technology when split on the point's base was started with flint blade or flake used as a wedge (fig. 2, 4). The following spread of initial split was carried out with antler chisels and wedges or even wood ones as well as thin flint flakes and blades (KNECHT, 1993, p. 147). However the mentioned operation, according to last author was carried out after primary shaping of blank and snapping off their distal part from the point base in the place of one or two transversal incisions or circular grooving. In fact she retuned to described

above hypothesis of Dr. Henri-Martin (1930, p. 36-37). However H. Knecht (1993, p. 147) supported own reconstructions experimentally. At the same time more sophisticated explanation of origin of tongued pieces was suggested too. She proposed that the negative removals from tongued pieces were removed specially by cleavage and wedging for use as wedge-like tools (fig. 2, 5, 6). The latter would have been used both for manufacture of split bases and hafting of projectile points or other tools (KNECHT, 1993, p. 151).

Also much more complicated method of split based points fixation was proposed and experimentally supported. For her opinion the base part of these points were inserted in deep slot of fore-shaft as in Hahn's reconstruction (fig. 2, 3-b) and binded over with sinew. However after that between the winds also small wood or antler wedge (specially splitted from tongued pieces) was hammered for better fixation of point in fore-shaft (fig. 2, 7). At the same time she indicated that during experimental use of projectiles hafted with this manner the separation of shaft and point was more numerous than direct damage of latter. It was different from archaeological data when larger body of split based points found on the different kinds of sites are damaged (KNECHT, 1993, p. 155). In addition the proposed reconstruction was also supported by H. Knecht (1993, p. 154-157) with some traceological observations of ancient Aurignacien points and even experiments for use their replicas in projectile weapons. Among other reconstructions of Aurignacian split based points fixation observed in literature we can to note some hypothesis of L. Vertes (1955, p. 111-131) when the smallest ones from Istallosko were used as arrow-heads and fixed with two possible methods. According to latter the wedge-shaped fore-shaft was inserted between winds or one from latter was held in special split of shaft (fig. 2, 12). Above-mentioned reconstruction about use of some smallest Aurignacian points as most ancient arrow-heads was supported by different prehistorians in Hungary and Ukraine (GABORI, 1969, p. 261262; DEMIDENKO, 1987, p. 3-4).

THE EXPERIMENTS WITH AURIGNACIAN SPLIT BASED POINTS PRODUCTION

The brief experiments for production of split based points were also carried out by author and a number of latter as well as different wastes of their production were manufactured from elk antler (fig. 6). For my point of view the obligatory wetting of antler and careful drive of split with both gentle bending and wedging were main component of Aurignacian split technology. Generally speaking the proposed method or so-called "split drive technology" is based on the change and use of natural mechanical properties of deer antler raw material after processing of one in the water (viz. bending strength, elasticity, longitudinal fibrous, etc.) when some latter beneficial qualities are increased more then four times (FILIPPOV, 1983, p. 19-23).

The efficient splitting is available with two related methods or versions of same technology after that the final reception of true tongued pieces or only snapped fragments are took place accordingly. The first, more complicated and improved version is based on production of two diagonal cracks, when as a result the tongued piece will have received and split on base of point will be much more adapted for efficient hafting of wedge-shaped wood fore-shaft of projectile (fig. 4, 6, 7). The second one is more simple and is connected with production of one longitudinal crack with the result that snapped fragment of distal part of antler blank will have produced (fig. 4, 8, 9).

Both versions of technology are tightly connected and well adapted with the method of fixation of point on wedge-shaped fore-part of shaft, which can be used also as a tool for additional control of direction of crack (fig. 4, 3) and continuation of latter during final hammering of fore-shaft between the winds of point. The winds of point for efficient fixation must be wet as well as sinew binding covered ones on the basal part of point (fig. 7, 9, 10). Just after drying of both the very firm hafting and good connection of point with fore-shaft is carried out.

1) *The production of Aurignacian split based points with removal of tongued pieces*

During my brief experiments 5 copies of split based points were manufactured with this method (fig. 6, 1, 4, 7). The production of split was carried out with the gentle bending of preliminary shaped "baguette" of wet antler or even preliminary sharpened proximal part of point in the place of transversal slot with some kinds of "baton perces" or even fingers (fig. 4). With this method we can start the initial crack and efficiently control the main direction of crack through the body of antler only on the whole (fig. 4, 1).

The production of initial crack is based on "lever effect" of handle or fingers (fig. 4, 1-a, 4) and use of good bending ability and longitudinal fibrous of wet deer antler. The direction of fibrous structure of antler must be exactly coincided with longitudinal axis of blank. In the case of diagonal direction of one (fig. 4, 2-c) will take place serious risk to form of asymmetrical initial crack as well as irregular shape of split at the whole (fig. 6, 6, 7) or even snapping off the wind of point totally (fig. 6, 9). This main condition is connected with the desirable presence of tips of all cutted longitudinal fibres on the surface of transversal incision (fig. 4, 2-b).

On the first stage of split production, the rhythmical bending of antler blank is accompanied with their moving in the hole of handle for definition of correct fulcrums of lever and stimulation of crack in desirable direction (fig. 4, 1, 1-a). After the emergence of latter the antler blank is inserted in hole deeper according to the spread of crack and bended with the same manner (fig. 4, 2, 2-a).

The additional control and spread of crack through wet antler blank can be efficiently carried out and stimulated with use of wedge-like wood, antler or bone tool as well as the similar shaped fore-tips of fore-shaft used as a lever and wedge (fig. 4, 3). The diagonal direction of crack is more typical when only gentle bending of blank without of wedge-like lever was used (fig. 6, 1, 2, 7), when the bending of future wind of point with the latter directed the crack in opposite side (fig. 8). With jointly usage of both mentioned operations we can to carry out the efficient control and spread of crack through antler blank. In fact the final choice

of concrete version of thechnology (more complicated and improved with removal of tongued piece or more simpler one without of latter) was defined by diagonal or more longitudinal ditecton of initial crack. On this stage both versions of technology can be changed each other.

When the first crack was deep enough, the similar operations concerned with slot manufacture, gentle bending and use of wedge-like lever were started from the opposite side of antler blank (fig. 4, 5). It is the most dangerous stage of mentioned version of technology and connected with the joining of both cracks directly in the central part of future point. If one among them was not deep enough or surfaces of both were not parallel in cross section (fig. 6, 5-a) one crack could be spread until to opposite side of blank. In the last case the second wind on base of future point could be broken off as this perhaps took place with some ancient specimens (fig. 2, 9; 3, 2, 12). When both diagonal cracks became sufficiently deep and joined in one place the transversal bending was made and distal part of blank could be snapped off (fig. 4, 7). Just only in last and successful case tongued pieces of different configurations and dimentions were wastes from production of split based points (fig. 1, 12; 3, 3, 4, 11).

However only in rare our cases (fig. 6, 1) the split was deep enough and at once was directly ready for efficient hafting of fore-shaft. After the removal of tongued piece and preliminary processing of split we can easy to continue one with the separation of "winds" even by the fingers or any organic wedge (fig. 4, 10). According my experience the easiest way for that was simple hammering of wedge-shaped fore-part of shaft in split directly during hafting of point (fig. 7, 7).

As a result of last operations concerned with continuation of split the interior surfaces of latter on experimental points are negative impressions of one another both produced with removal of tongued pieces and without of ones (fig. 6, 3, 6; 7, 3, 3). It is notable, that just the last sign was the most convicting argument of H. Knecht (1993, p. 146-147) during the critical observation of "Peyrony's hypothesis of split based points production with removal of tongued pieces. At the same time the frequent discrepancy of dimentions of splits and tongued pieces in the same assemblages is

explained by last operation too. The final shaping of point is carried out just after production of basal split. During this operation some defects of split (e.g. different thickness of winds, asymmetry or absence of true parallel of their interior surfaces etc.) can be removed too.

2) *The production of Aurignacian split based points with removal of snapped fragment*

During experiments with this method three points were produced (fig. 7, 1-6). On the first, initial stage and stimulation of crack's emergence in the place of transversal slot is carried out with the same methods as was described above in previous version of this technology (fig. 4, 1). The main difference is connected only with the preparation of deeper slot (approximately until to middle part of blank) and more intensive use of wedge-shaped lever for spread and drive of crack in longitudinal direction (fig. 4, 3). Some displacement of crack relatively to central longitudinal axis of antler blank is not serious problem for this method because the some correction of split position directly to the central part of point is available during the final shaping of their surfaces.

For given reasons the best way for more efficient production of split was connected with preparation of slot and start the crack just since the compact side of antler blank and drive of split in direction parallel to latter surface. The unnecessary porous surface of point can be easily removed during their final shaping. With this method also the risk of snapping of bended wind is reduced by better ability concerned with bending strength just of compact part of wet antler (fig. 6, 8, 9). However some successful splits were produced even from porous side of antler blank too (fig. 7, 1, 4).

At the same time, the simple snapping of future wind of point during unsuccessful bending with lever (fig. 4, 3) is more available just for this version of technology than in the first one (fig. 6, 8). After such cases the wedge-like pieces were removed from main blank of antler (fig. 6, 9). As was noted above and according to H. Knecht's (1993, p. 150-152) suggestion these pieces from archaeological assemblages (fig. 3, 5-8) were specially splitted from tongued pieces and used for points hafting (fig. 2, 5-7).

After the preparation of split (fig. 4, 8) the forming second wind of future point was carried out with the production of one or more slots from opposite parts (side and circular surfaces included) of antler blank and simple snapping off their distal part (fig. 4, 9). Other operations concerned with continuation of split are the same as was described above with fingers or wedge-shaped fore-part of shaft (fig. 4, 10; 7, 7). As a result of forming of second wind the snapped antler fragment with remains of two transversal slots was removed (fig. 7, 2, 5). Perhaps some antler snapped fragments as well as unfinished points from archaeological assemblages published by H. Knecht (fig. 3, 1, 9, 10, 12) were produced just with this method. According to our experimental results some atypical tongued-like pieces are available too (fig. 7, 5). As a very typical sign of splits produced with last method is clear correspondence of their interior surfaces as negative impressions of one another (fig. 7, 3, 6).

THE EXPERIMENTS WITH HAFTING AND USE OF AURIGNACIAN SPLIT BASED POINTS

The proposed hypothesis of Aurignacian split based point hafting is based on real archeological and ethnographical cases of joining of splitted and forked notches of different parts of projectiles and also on some experimental investigations of author. The first category of ones are well described in literature when both such wood or bone-antler parts were found in joined position (e.g. see: CATTELAIN, ONORATINI, 1993, p. 15-22, etc.). Among the latter we have no cases when the splitted winds or forked tips were both inserted in slots, especially of wood parts. On the contrary there are a lot of cases when differently shaped parts (first of all wedge-like) were inserted between winds or forked tips. Practically among known methods of joining of different projectile parts both of archeological and ethnographical weapons only three main ones are existed (viz. splitted or forked with wedge-shaped or even sub-forked tip accordingly, beveled with beveled surfaces and conical or pyramidal-like with hole of similar form) (see for example: CATTELAIN, ONORATINI, 1993, fig. 7; LJAPUNOVA, 1963, p. 155).

For given reasons splitted base of points were joined with wedge-like fore-shaft of projectile (fig. 7, 9). As was noted above wedged fore-shaft could be used for both production of split and continuation of latter on the final stage (fig. 4, 3; 7, 7). The hafting method of points also was adapted and tightly connected with their technology of production. The winds of ones must be also wet as well as processed with the same manner sinew binding. After hammering of wedge-like fore-shaft between winds of point, their base was binded with wet sinew and after drying of both the efficient fixation was carried out totally (fig. 7, 9, 10).

The principal efficiency of aforementioned method of hafting was tested by author in 1991-1992 when three replicas of Aurignacian split based points from reindeer antler were fixed with this manner and used as arrow-points during experiments with the bodies of two freshly hunted wild boars ("Sus scrofa", 3-4 years and 6-8 months old accordingly). In spite of these points of different sizes were fixed on wedge-like fore-shafts with the aid of mixture of pine resin and bee wax (in the proportion from 1: 3) and then secured with hemp-thread (fig. 7, 11-13) the sinew binding according to my last experiments allowed the efficient fixation too.

During experiments smaller point (fig. 7, 13) was used two times. The first case was connected with shooting in young (near 8-6 months old) wild boar hunted near 2 hours before experiments. The point was hit in chest and pierced of rib through on the depth 27 cm. Practically point has no serious impact fracture and separation from shaft (fig. 7, 14). The last case perhaps was stipulated also with cartilage structure bones of young animal. After resharpening of tip the same point was used during experiments with body of male boar hunted near 4 hours before experiments. The point was hit in pelvis and pierced flesh on 10 cm depth but also was totally damaged from fore-tip and both winds (fig. 7, 15). Two other larger points were shot in the same body near 7 hours after death and (even taking into consideration of process of cooling and condensing /firming ?/ of flesh) received no impact fractures or detaching from the shafts (fig. 7, 11, 12).

So even preliminary above-mentioned results are quite different from that of H.

Knecht which indicated more typical damage of fore-part of shaft of projectiles than directly antler points (Knecht, 1993, p. 155). For my point of view the latter is only result of choice of wrong and unreal method of fixation of split based points in shaft of projectile weapons. The wedging of deep transversal slot of wood fore-shaft (much more fragile than antler winds of points) is direct preparation for easiest their damage after the first contact with target.

For author's point of view active usage of water both for production and fixation of Aurignacian split based points indicated also that true resin (e.g. bee wax, pine resin, birch tar, etc.) perhaps was not involved in process of their attachment. Only fish glue based on the water could be available for that. However some above-mentioned adhesives could be used for improving of fixation after drying of winds of point and sinew binding too.

In the addition according to proposed method of Aurignacian split based points fixation some reconstructions of their usage and connection with concrete kinds of projectile weapons become more doubtful. First of all it is concerned with the problem of bow and arrows invention and definition of very small split based points (for example from Istallosko assemblage) as true and most ancient arrow-heads (VERTES, 1955, p. 111-131; GABORI, 1969, p. 261-262; DEMIDENKO, 1987, p. 3-4). For my observation with above-mentioned method (contrary to hafting of tanged points) even smallest points could be efficiently fixed on the tips of sufficiently massive shafts of projectile weapons such as darts or light spears. In the addition they could be hafted on fore-shafts as a rule much more thinner in diameter than the main-shaft. That is why even smallest Aurignacian split based points perhaps were not defined as true arrow-heads.

Perhaps the Aurignacian points also were supplied with some lithic lateral barbs as it took place on some kinds of death-spear points of Australian aboriginals of New Southern Wales (NUZHNYI, 1992, p. 165, fig. 44, 2, 3). For latter purposes could be used different microinsets of Aurignacian assemblages (Dufour bladelets, micropoints of Muralovka-Gora Pulawska type etc.). The morphological signs of ones (absence of

regular blunted retouch processing, twisting and curvature of prismatic blanks etc.) indicate on absence of methods of vertical fixation with resin and use of sharp cutting edges of prismatic blanks for their usage as insets of composite projectile points.

According to first traceological observations of Aurignacian microliths from some East European assemblages (Muralovka, Zolotovka 1, Suren' 1, Anetivka 1 etc.) their retouched surfaces were abrasively blunted (FILIPPOV, 1977, p. 167-168; NUZHNYI, 1992, p. 165). It is notable that the special abrasion of sharp edges of lithic details of projectile points was used by Stone Age tool makers in different parts of world just for hafting of ones with binding (sinew, hair, plant cords etc.) and low development of methods of fixation with resin-like adhesives.

For given reasons and some ethnographical cases the following complete reconstruction of Aurignacian point is available (fig. 7, 9-10). The microlithic insets perhaps were fixed with sinew or other binding on the surface and even basal part of point in flattened position as fish scale-like barbs. In fact this method of microinsets fixation is tightly connected with technology of points hafting with binding at the whole. In addition, the groups or whole lines of incisions on the surface of different kinds of Aurignacian points (fig. 2, 8-10) probably are indicated just on mentioned model of insets fixation too (MULLER-KARPE, 1966, taf. 26; HAHN, 1977, taf. 58, 59, 127; BARANDIARAN, 1982, fig. 3; DESBROSSE, 1982, fig. 8; OLIVA, 1991, fig. 11, 13; DEWEZ *et al.*, 1993, tab. IIV etc.).

CONCLUSION

The proposed two related methods of production of Aurignacian split based points or "split drive technology" perhaps explained some above-mentioned arguments of H. Knecht (1993, p. 142-147) against their manufacture by bending and splinping as well as origin of tongued pieces. However the latter were not obligatory wastes for production of splits with bending in "baton perces" or by fingers and use of wedge-shaped levers. The tongued pieces were available only in case of more complicated and

improved version of technology connected with production of more perfect split formed by two diagonal cracks. This split was better adapted for fixation of wedge-like fore-shaft because winds had reduced loading and bending during hafting. As was noted above the such fore-shaft could be used as a lever for initial production and drive of split as well as a wedge for continuation of one.

During production of split with other simpler version of technology only one longitudinal crack was manufactured on the base part of future point with the similar tools ("baton perces", wedge-shaped fore-shaft etc.) and methods described above. As a result only snapped fragment of antler blank with two remains of transversal slots was received.

The "split drive technology" also made explicable both dominating of flattened cross-section of morphology of Aurignacian split based points and large dimensions of some tongued pieces (fig. 3, 3, 11) better adapted for gentle bending. The absence of clear correlation between dimensions of "splits" and "tongues" as well as only periodical presence of latter in some assemblages are explained by proposed technologies of production and hafting too.

As was noted above the proposed method of split based points fixation is attached with above-mentioned technology of their production. The flat wedge-shaped wood fore-shaft of projectile tool was inserted and even hammered between the wet winds of split based point. The latter were covered with wet sinew binding which fixed one on the shaft of weapon just after the dry of both. On the other hand the mentioned pattern of fixation perhaps was adapted for use of water-based adhesive substances only.

In the addition on the final stage of hafting of Aurignacian antler points on their surface or/and basal part could be fixed also with binding a group of microlithic insets (Dufour bladelets, micropoints of Muralovka type or ever some curved and twisted microblades without of secondary modification) as lateral fish scale-like barbs.

It is significant that both technologies of production and hafting of Aurignacian projectile weaponry assemblage

as well as constructions of points at the whole are much more improved and complicated then that of other Early Upper Paleolithic cultures of Europe.

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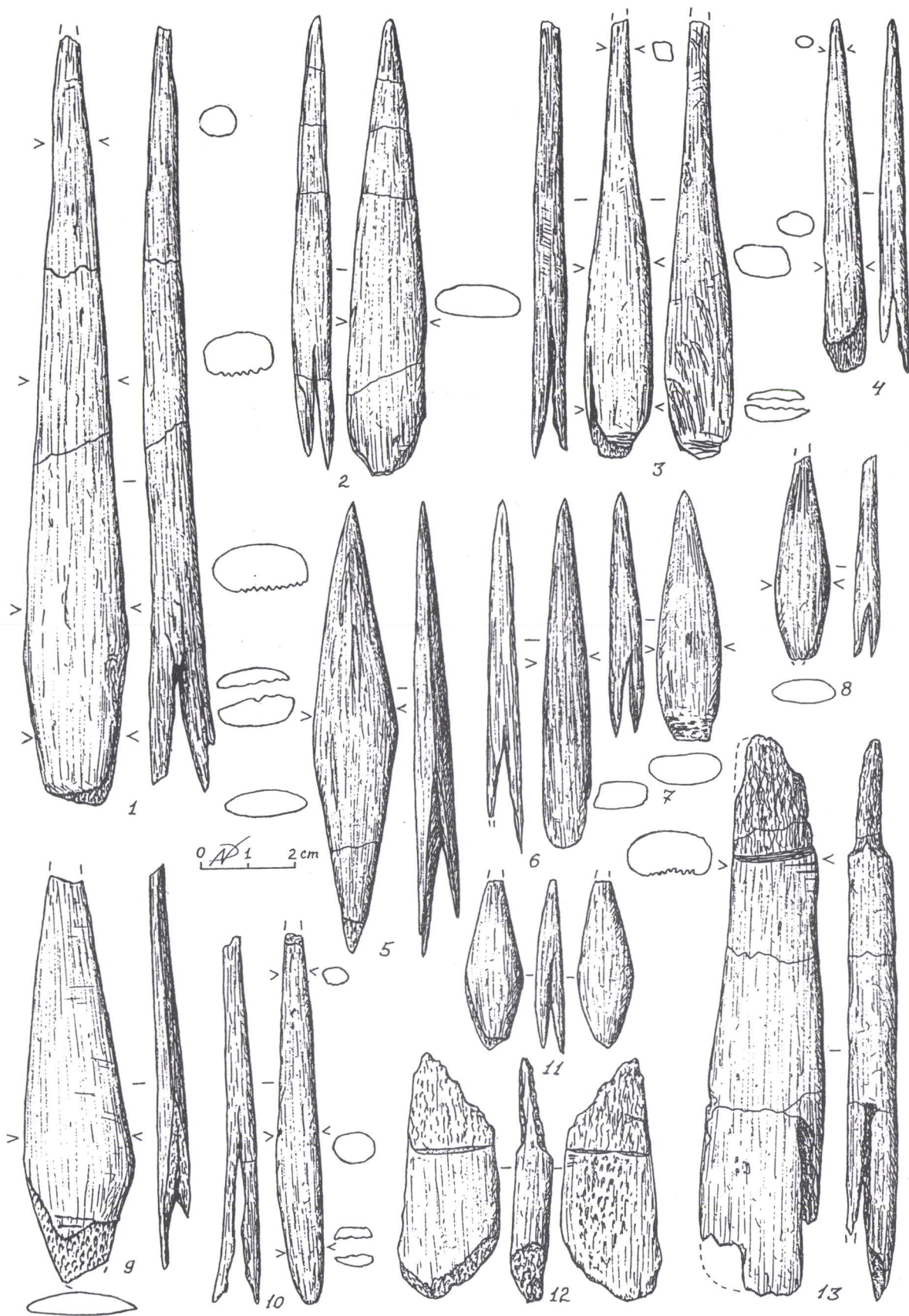


Fig. 1 : Aurignacian split based points (1-11), tongued piece (12) and splitted tongued piece (13). 1- Gorge d'Enfer; 2, 3, 8 -Abri Blanchard; 4, 6 -Abri Poisson; 7 -Tarte; 9-Trou al'Wesse, Petit Modave; 10-Vogerherd; 11-Goyet; 12, 13 -Abri Castanet (1, 3, 4, 10, 12, 13 -according to J. Hahn; 2, 6-8 -according to H. Knecht; 5, 9, 11 -according to C. Bellier and P. Cattelain).

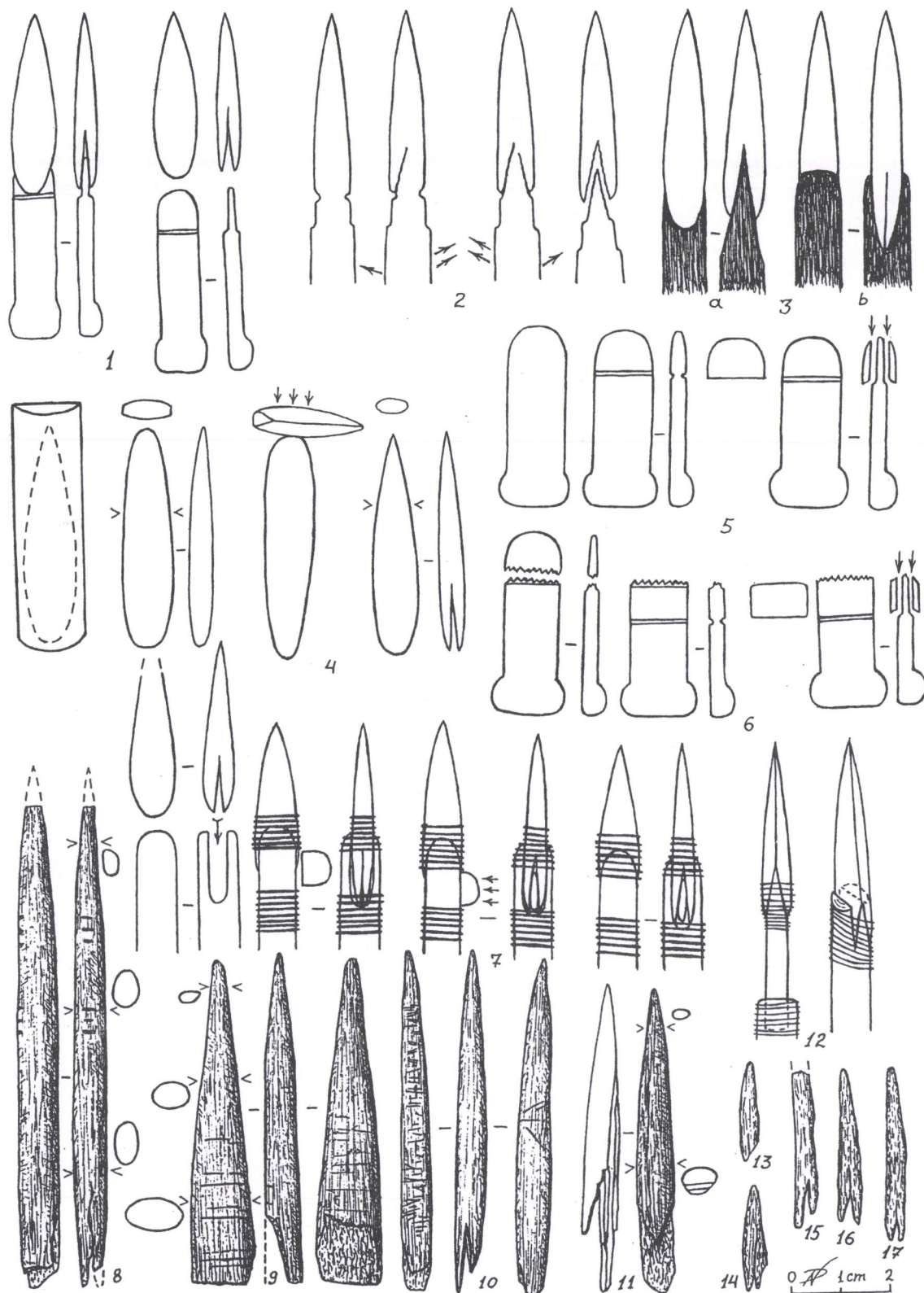


Fig. 2 : Reconstructions of Aurignacian points production and hafting and origin of tongued pieces (1-hypothesis of D. Peyrony; 2, 3/a, b -hypothetical methods of production and hafting according to J. Hahn; 4-7 proposed reconstructions of points and tongued pieces production and method of hafting of H. Knecht; 12 method of split based points fixation as arrow-heads according to L. Vertes) and Aurignacian points with transversal incisions and very small sized (8, 9, 11 Trou de la Mere Clochette, according to R. Desbrosse; 10-Santimamine, according to I. Barandiaran; 13-17 Istallosko, according to L. Vertes).

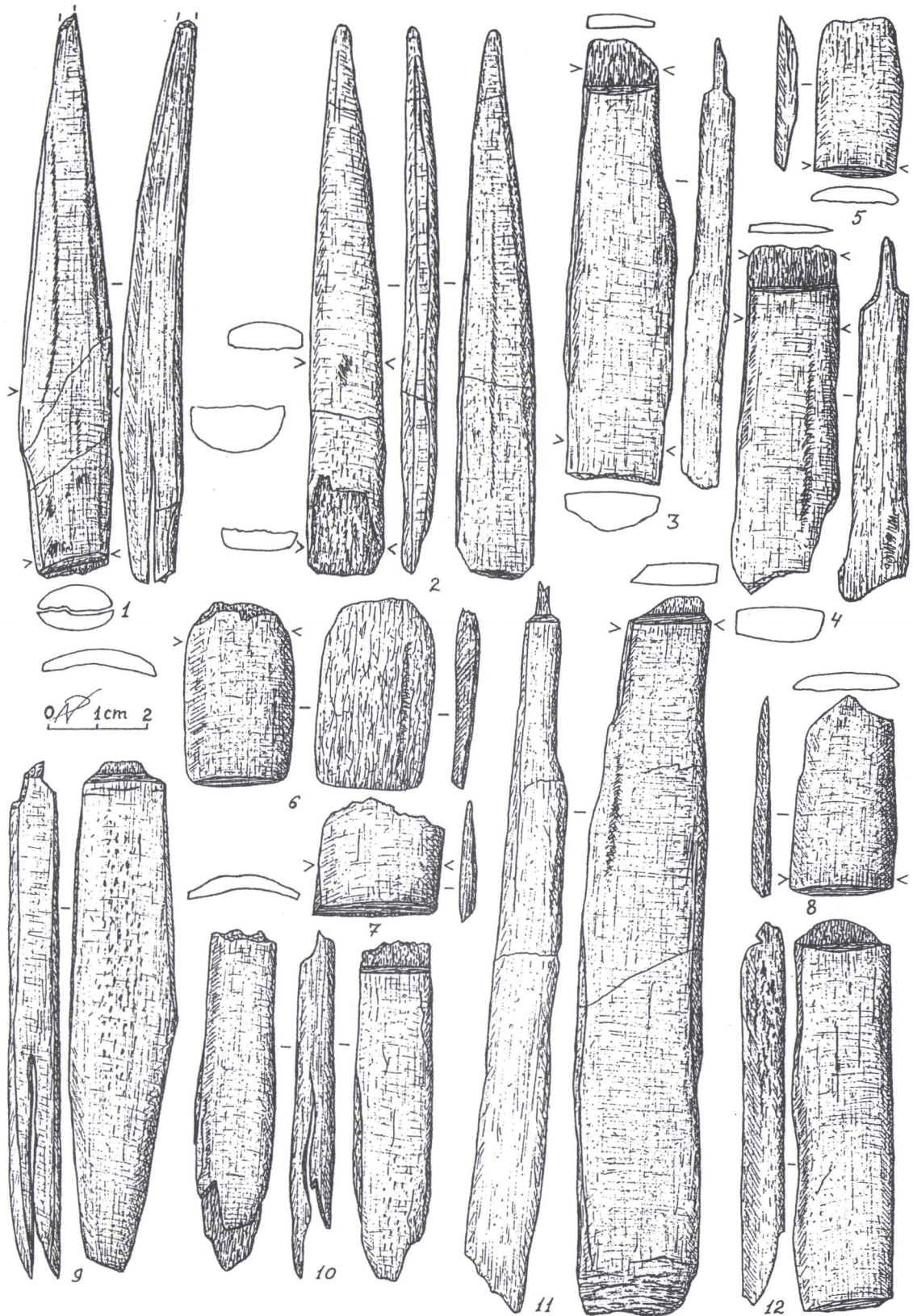


Fig. 3 : Blanks of split based Aurignacian points (1-2), tongued pieces (3, 4, 11), small "wedges" (5-8), splitted tongued (9) and snapped (10) pieces, snapped fragment (12) (According to H. Knecht: 1, 9 -Saint-Jean-de-Vétriges; 2, 10, 12 -Abri Blanchard; 3, 4, 11 -Abri Cellier; 5-8 Abri Castanet).

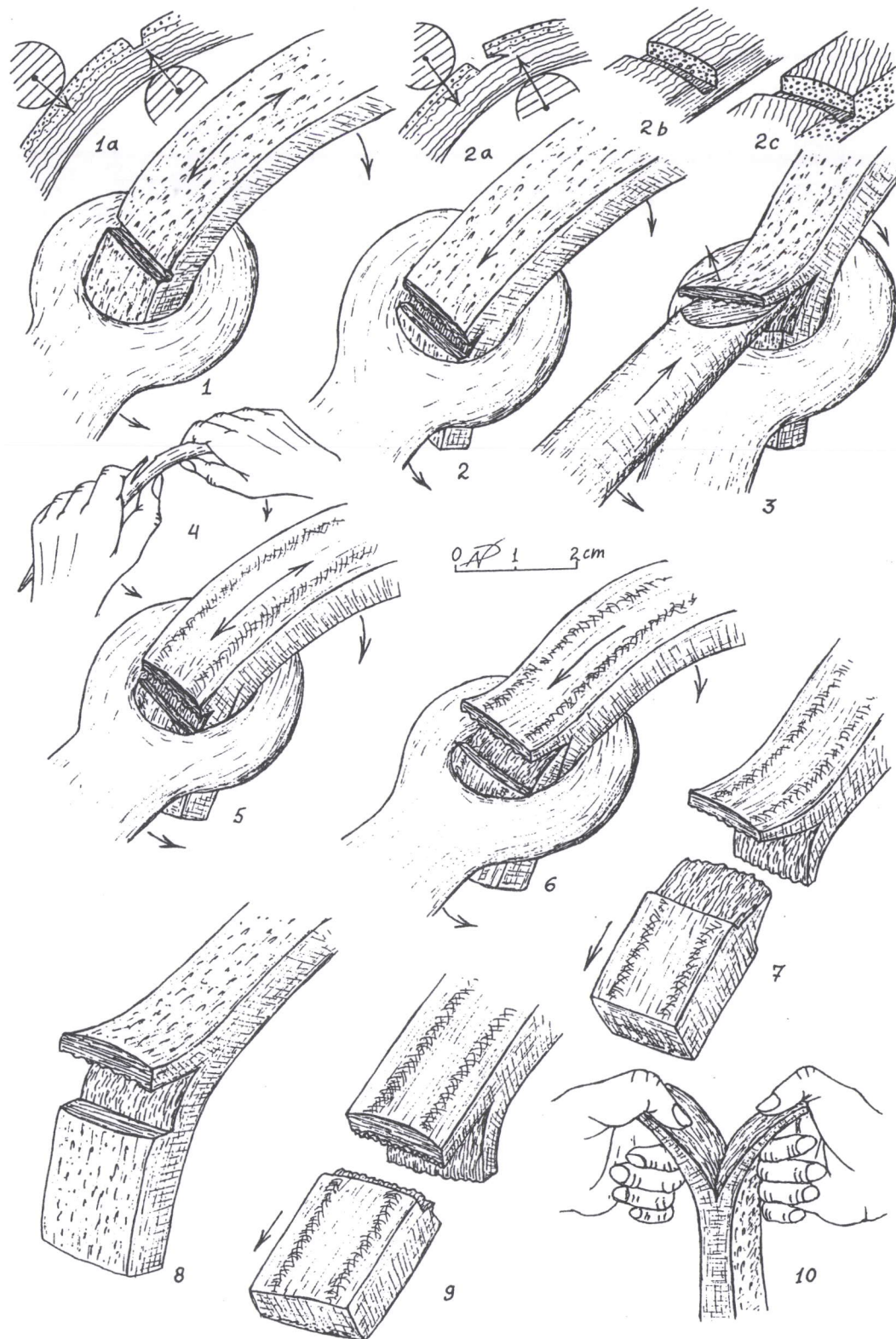


Fig. 4 : The experimentally supported technologies of split based points production of "split drive technology" with removal of tongued pieces (1-7) or snapped fragments (2, 3, 8, 9) and method of continuation of split (10). Some theoretical schemes of initiation and spread of crack through antler during the bending (1-a; 2-a; 2-b; 2-c).

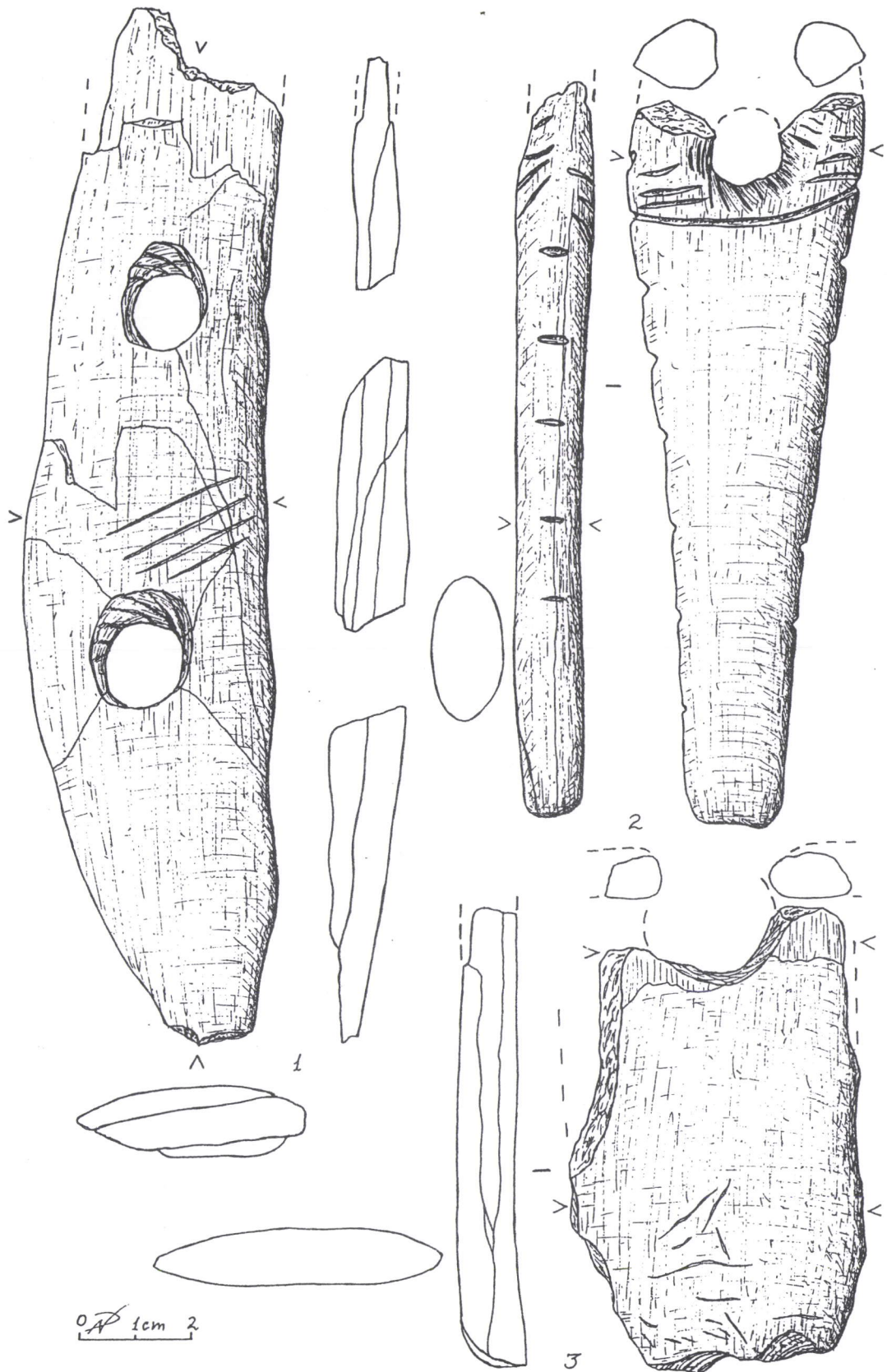


Fig. 5 : The Aurignacian "baton perces" which perhaps were used for production of split based points with bending and "split drive technology" (1-Vogelherd V, ivory; 2Vogelherd IV, ivory; 3-Wildscheuer III, ivory. All pictures according to J. Hahn).

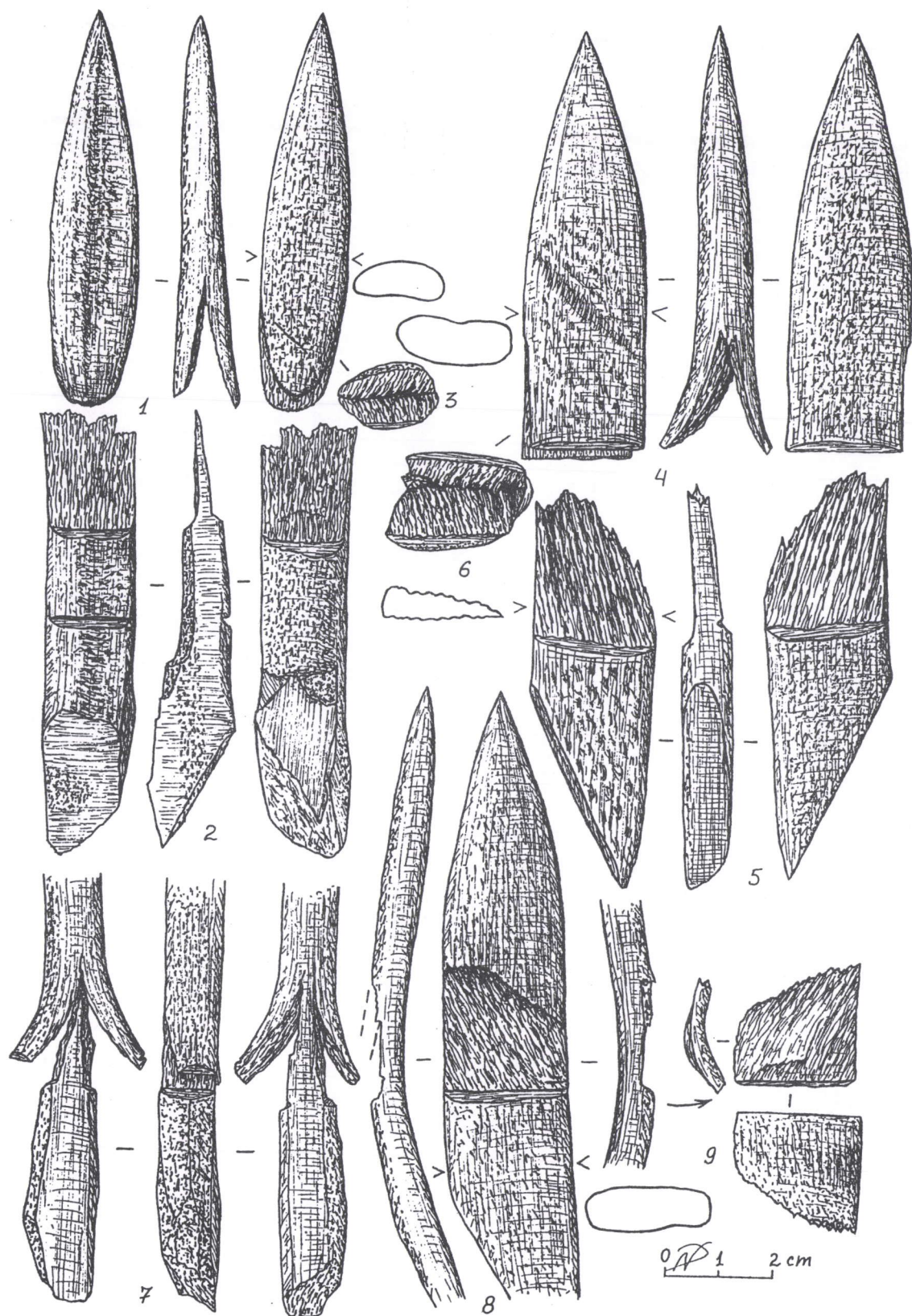


Fig. 6 : Experimentally produced Aurignacian split based points and wastes of their manufacture with the first version of "split drive technology" on the different stages of processing.

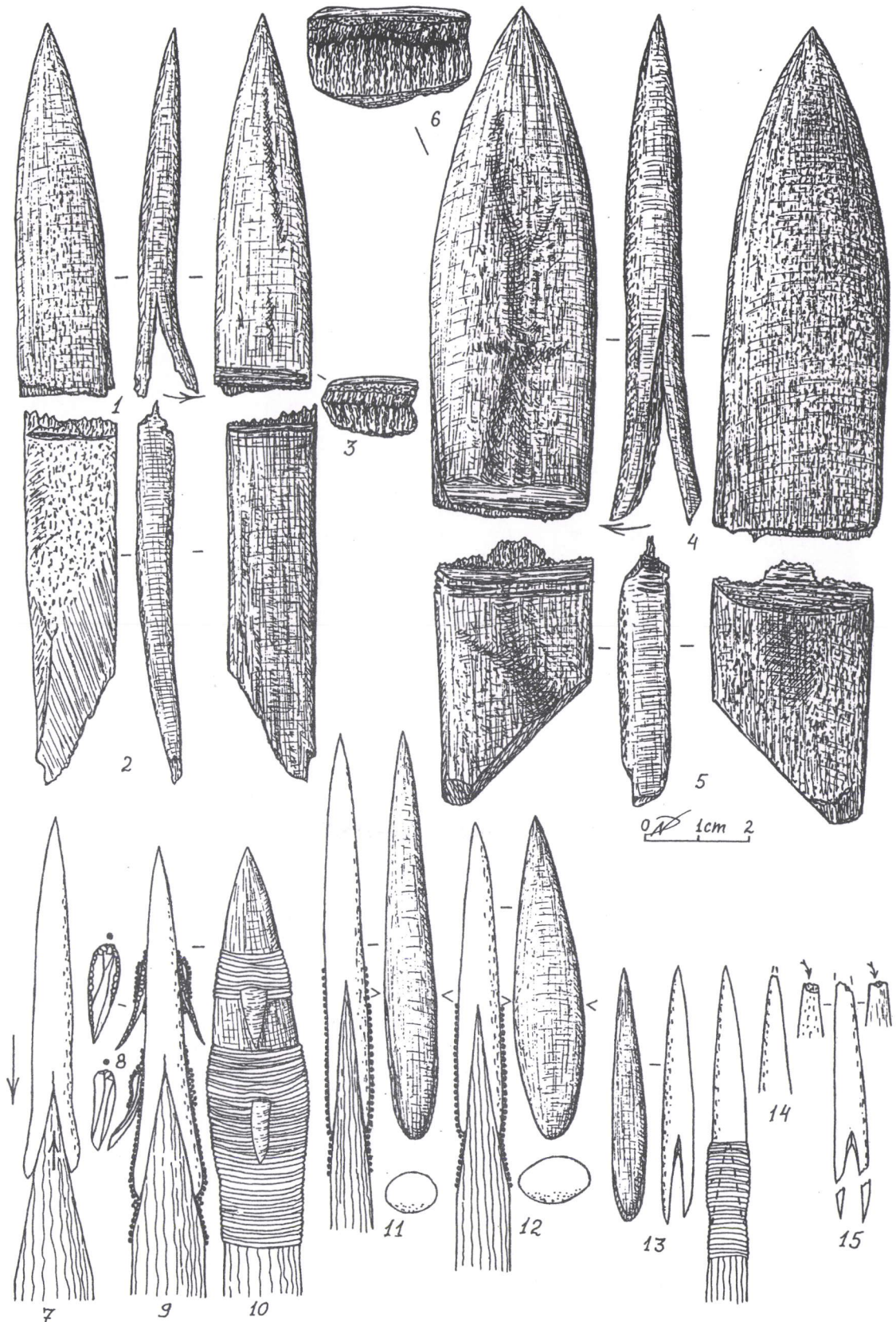


Fig. 7 : Experimentally produced Aurignacian split based points and wastes of their manufacture with the second version of "split drive technology" (1-6), the possible method of hammering of split based point on wedge-shaped fore-shaft (7), the reconstruction of hafting of Aurignacian split based points and fixation of lateral microlithic insets (8-10) and replicas of points used during the experiments with wild boar targets before and after of first and second shooting (11-15).