New Results for the Biface from Säckingen, 'Flühwäldchen', Baden-Württemberg, Germany.

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Abstract

A peculiar stone with the shape of a heart caught the attention of a young girl in 1916. Her father put it on display together with other fossils they had collected. Only after the collection was offered to the local museum in the early 1920s, was the piece recognized as a paleolithic biface. From the beginning however, doubts were raised as to the source of the raw material used and as to the unstratified position on a 'Lower Terrace' of the High Rhine River. A new analysis of the raw material reveals that it is a silcrete which can be traced to local sources in the Buntsandstein. A microwear analysis of the preserved edge reveals a specific stepped retouch and traces which provide evidence that indicate what the biface was potentially used for. According to the morphotype and size the cordiform biface is attributed to the 'Upper/Final Acheulean'. A scenario of the quaternary environment on the promontory northwest of Bad Säckingen is presented. So, Neandertals were attracted to the area, with skills to knap an exceptional cordiform biface from a raw material outcropping in the region close by.

Discovery and Research History

The biface from Säckingen, 'Flühwäldchen' was discovered in summer 1916, when master cutler Bär went for a walk with his children towards the forest of Flühwäldchen. At the border of the woods, a pile of field stones was assembled, as the adjacent lands of the Weihermatten had been turned into potato fields during the First World War 1914-1918. There, one of the girls found the biface, lying loosely on the pile of stones (Fig. 1). It caught her attention due to its peculiar shape. Bär added the piece to his collection of fossils. (Emil Gersbach, quoted in Zotz, 1930; Deecke, 1932) .

In the early 1920's, this collection was offered to the local museum. Emil Gersbach, expert in the prehistoric landscape of the region, immediately recognized the "stone with the shape of a heart" as a palaeolithic biface. The daughters, by then adults, reconfirmed the Flühwäldchen as the find spot and the specific circumstances of its discovery (Zotz, 1930; Deecke, 1932). An illustration of the typical biface with its deep and invasive removals (retouches) was published in 1926 by Robert Lais, though without revealing the location's name (Lais, 1926, 42).

Figure 1: *Location of where the biface of Säckingen, 'Flühwäldchen' was found in 1916 (ordnance map 166 of 1882).*

The raw material of the biface was first analyzed at the Geological Institute of the State Baden, located in Freiburg i. Brsg. and directed by Wilhelm Deecke. According to a comparative analysis, the material used was considered to be a 'limnic quartzite' of the Parisian basin. The biface was then put aside as a piece of uncertain origin (Zotz, 1930; Deecke, 1932).

A re-analysis of the biface's material was initiated by Lothar Zotz who had been employed as an assistant at the Institute in Freiburg; a local origin of the raw material was confirmed by geologist Fritz Wiegers of the Prussian Geological Institute in Berlin. Zotz then published the exceptional object in 1930 as 'The Acheulean axe of Säckingen a. Rh.' A short popular version with photographs appeared in 1931 (Zotz, 1931).

In 1932 Deecke responded with a rather harsh review. He argued strongly that the object should not have been published because it was of disputed origin. According to his expertise, habitus and patina

of the biface from Säckingen are comparable with artifacts from Belgium, such as at Spiennes, and from Northern France. The similarity with pieces from Central France was confirmed by Hugo Obermaier upon viewing the biface. Deecke added his own petrographic analysis (see chapter 5) and critically discussed the terrace situation of the find spot (see chapter 6). He declared, "Such material is totally unknown in Baden. For all these reasons, this piece was put aside as uncertain." (Deecke, 1932). Skepticism towards the find may historically be explained by archaeological forgeries, such as famous Piltdown Man or, more regionally, a harpoon found at Wyhlen in 1924, made in a mesolithic style from a recent bone (Schmid & Maier, 1956).

Zotz pointed to the discovery of another palaeolithic site at Murg (G. Kraft, 1935; Pasda, 1994) on a loess covered granite promontory (Zotz, 1938, 184; 1939a, 11f.). The site Kalvarienberg at Murg is located 6.3 km east of the Flühwäldchen, albeit at a higher altitude. Zotz further remarked that the same raw material, as determined by Deecke, was discovered in the region (close to Lörrach) (Zotz, 1939b, footnote 5). There was evidence enough for a local origin of the biface as Zotz suggested. Kraft replicated his new argument, but noted that Deecke's stratigraphical concerns had not been addressed yet (Kraft, 1940). Zotz assessed the chronology more closely by assigning the biface to the 'Late Acheulean' (Spätacheuléen) and by mapping it among sites belonging to a 'middle level of bifaces' (mittlere Faustkeilstufe) (Zotz, 1939a).

As to the stratigraphical position, Zotz noted that many palaeolithic artifacts such as bifaces were not found in situ; many were lying on the surface for an extended period of time, before fluvioglacial processes redeposited them (Zotz, 1951).

Hansjürgen Müller-Beck included the biface from Säckingen in his synthesis on palaeolithic cultures and stratigraphies in southern Germany. As a surface find, it cannot be attributed to any stratigraphy he argued. Also, a secure link to a quaternary history of the Rhine valley is missing. The biface does not fit into any cultural group (Formengruppen) as he defined them for southern Germany. Based on the raw material, he agrees with an earlier assumption that the piece was most likely imported into Germany as a collector's item sometime during the last two centuries. He concluded that the circumstances of its discovery do not contradict such an interpretation (Müller-Beck, 1956, 20 and 25).

Gerhard Bosinski (1967) described the biface of Säckingen, 'Flühwäldchen' without replicating the controversy around it. A new interpretative drawing was added. The location was included in a map for middle European sites of the 'Upper Acheulean' (Jungacheuléen) or 'Lebenstedter Group'. (At the time, Salzgitter-Lebenstedt was considered to date into a pre-Eemian period.)

Egon Gersbach (1969) listed the biface in his comprehensive catalogue of prehistoric artifacts of the High Rhine valley, "In the year 1916, a broad triangular biface of limnoquartzite was picked up from a pile of field stones on the Northern border of the Flühwäldchen, community forest district II, Flüh, Lgb. No. 1670/2. The field stones were collected on the field of the old sports ground west of the Weihermatten, Lgb. No. 654 which was cultivated during World War I 1914-1918 as a vegetable garden. The spot is located on the highest Lower Terrace. For this reason, and because of its allochthone, French (?) silex material, the magnificent Late Acheulian biface was considered on various occasions as an import in modern times from the West; whether rightly or wrongly so is hardly to be determined anymore."

For Clemens Pasda (1998) the origin and the circumstances of discovery of the biface from Säckingen, 'Flühwäldchen' were too controversial to list the location of the Flühwäldchen as a palaeolithic site.

A raw material comparison with local 'limnic quartzite' was undertaken by Michael Kaiser (2005). He concluded that the materials were not from the same geographical origin. Its most probable origin was in the southern or western part of France (Kaiser & Braun, 2006).

In 2015 Jürg Sedlmeier suggested a re-analysis of the biface's raw material. The result thereof is presented in chapter 5.

The Morphology of the Biface and Typological Characteristics

The biface of Säckingen, 'Flühwäldchen' is a flat, almost symmetrical biface with two convex edges of equal length. The biface is shaped by deep and invasive removals oriented from both edges towards the center. Removals cover both faces. The base is canted and retains a lateral cortex (Fig. 2). One edge is straight whereas the other one is twisted. The angles of the edges range between 33° and 57° and are somewhat higher on the straight edge. The transverse section is biconvex (Fig. 3).

The biface is cordiform, according to the widely used scheme of Bordes (1961) (Le Tensorer, 1998, 2013). Zotz described the biface as broad-triangular

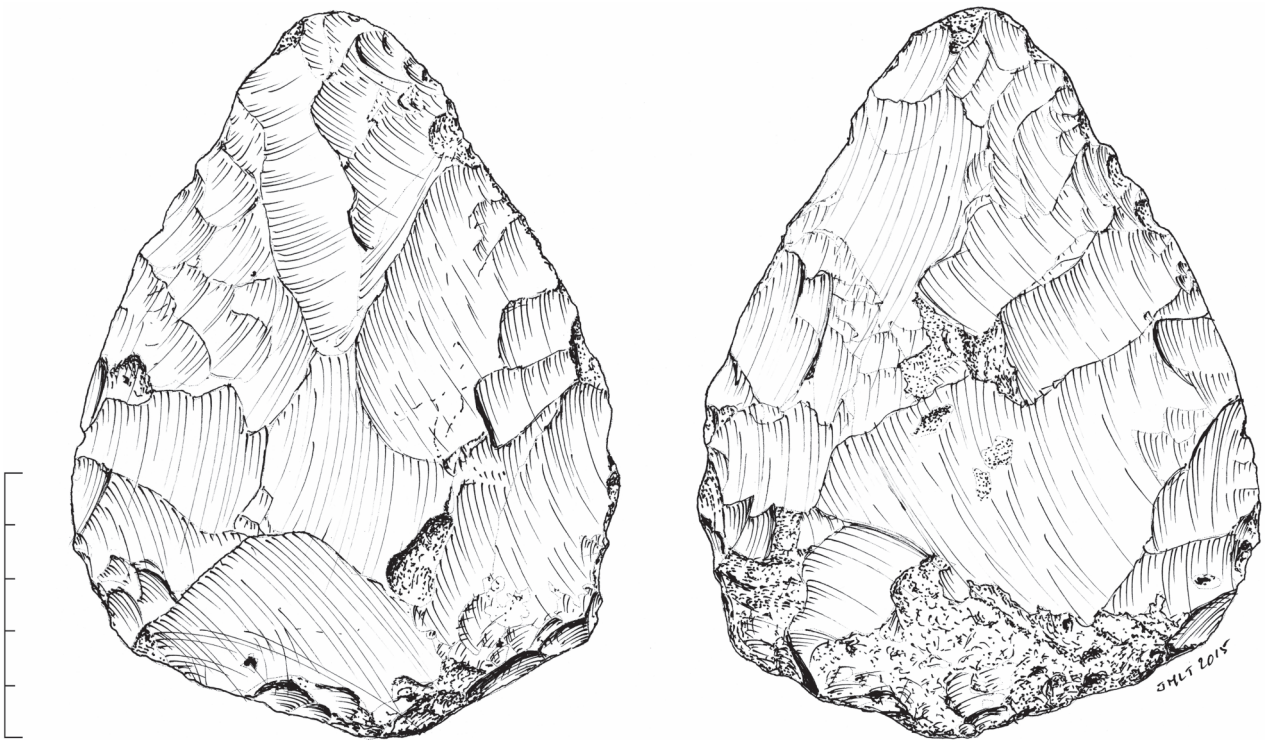

Figure 2: *The biface of Säckingen, 'Flühwäldchen' (drawing by Jean-Marie Le Tensorer).*

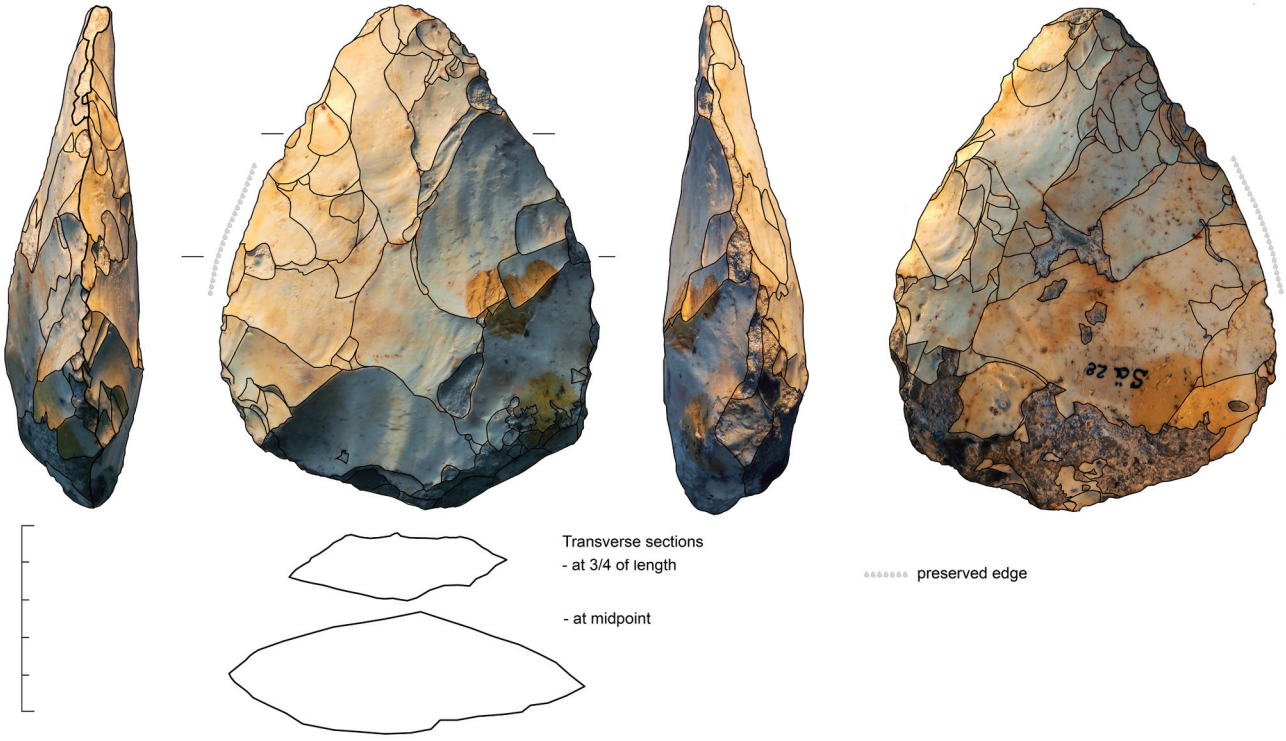

Figure 3: *Photos with contours of biface Säckingen, 'Flühwäldchen', from left to right: straight edge; side without inventory number; twisted edge; side with inventory number 'Sä28'; transverse sections at ¾ length and at midpoint; preserved edge is marked; scale=5 cm.*

(breit-dreieckig), a characterization which is adhered to by later authors (Gersbach, 1969). Bosinski subsumed the broad-triangular biface in his scheme typologically among the massive bifaces with a length of more than 10 cm (Bosinski, 1967).

The measurements of the biface with inventory no. Sä28 are as follows: the maximum length (L) is 134.5 mm, the maximum width (m) is 102 mm and the thickness (e) is 38 mm. The weight is 417.5 g. The ratio for elongation (L/m) is 1.32 which groups the biface among the non-elongated or typical cordiform bifaces (<1.5). With a refinement ratio (m/e) of 2.68 the biface fulfills the criteria of a flat biface (>2.35) (Fig. 2, Fig. 3).

A typological assessment provides a chronological bracketing, next to a stratigraphical assessment and an independent radiometric age determination (if possible). There are well-known draw-backs to a traditional typological scheme, as set up by Bordes, and efforts are made to adapt and further develop this and other schemes with an increasing stock of assemblages and a shifting focus (e.g. Ruebens, 2012, for Late Middle Palaeolithic bifacial tools, or Jagher, 2016 for bifacial assemblages in the Levant, Western Asia).

Cordiform bifaces appear in Northern Europe by around 0.5 ma and exist in variable frequency until the demise of Neanderthals. They appear in all glacial cycles during cold as well as warm periods, i.e. during oxygen isotope stages (OIS 13 through OIS 3). In addition, the morphology of a biface does not only depend upon time- and space-related styles, but also upon the shape (and quality) of the raw material selected or available, the tool's curation and use-wear.

Some examples of cordiform bifaces from stratified and dated contexts follow: At the British site Boxgrove, (OIS 13/12) 9% of recorded handaxes fit the definition of a typical cordiform (17 out of 183 handaxes extracted from Marshall *et al.*, 2002). - On the high terrace at Abbeville in North-east France, at the site Carrière Carpentier, five bifaces "close in morphology to the Boxgrove tools" were excavated during new fieldwork 2011-2013, one of them being a flat cordiform biface. They were found at the top of the slope deposits 3D which are dated into OIS 13/12; for the bifaces, an age of OIS 15/14 is modelled (Antoine *et al.*, 2016). - A very symmetrical cordiform biface has come to light at Saint-Pierre-lès-Elbeuf in North-east France, during new excavations into a loess of an OIS 10 cold event, affected by a pedogenesis of OIS 9 (Moncel *et al.* 2015, Fig. 16, 5).

With the appearance and spread of Levallois prepared core techniques during the Early Middle Palaeolithic (OIS 9/8 through OIS 6), bifacial technologies become a marginal phenomenon (Ruebens 2012; Villa 2009). Still cordiform bifaces can be found in sites such as Grotte Lazaret with levels of OIS 6 or Gentelles CXA of OIS 5e. Cordiform bifaces appear, with a rather thick base, in layer 6 of la Micoque, Dordogne (Bordes, 1961, 80; Patte, 1971) and must be younger than witnessed layer 5 (or L2/3) dated into OIS 9/8) (Falguères *et al.*, 1997). From the Alsatian site Achenheim, one cordiform biface, made from phtanite, is known from level 15 (end of OIS 6) and a large uniface from level 17a (OIS 6) (Junkmanns, 1985).

Within the Late Middle Paleolithic assemblages (LMP, OIS 5 to 40 ka) bifaces are common. Bifaces are important elements of the definitions of the Moustérien de tradition acheuléenne (MTA), the Mousterian with Bifacial Tools (MBT), the Keilmessergruppen (KMG), and the Micoquian (MIC). Cordiform and ovate bifaces almost serve as fossiles directeurs for the MTA (e.g. Frick & Floss, 2015). However, bifaces of the MTA of southwest France, dated into OIS 3, are significantly smaller than the biface of Säckingen, 'Flühwäldchen': average length of 1,122 bifaces from five classic MTA sites is 68 mm only, as compared to the biface's length of 134.5 mm. For two sites from northern France, Saint-Just-en-Chaussée and Catigny, or for the British site Lynford, average lengths of bifaces are 109, 100 and 101 mm respectively and imply that a handful of bifaces of comparable size must be present in these assemblages (Ruebens, 2012, Appendix 9, own calculations, based on assemblage size, standard deviations and expectancy values).

At the time of discovery, no other biface of comparative symmetry was known in Germany. Since then, several more have been found. Just a few are to be named: An exceptionally well-made biface originates from the Middle Elbe gravels at Gerwisch, found in 1957 (Weber *et al.*, 1996). Another more triangular biface with the dark patina of a peat (early Würm?) comes from a gravel pit at Sprotta, 25 km northeast of Leipzig (I. Kraft & Seiler, 1999; Seiler, 1998). In 1952 and 1958, a cordiform biface and a uniface were found at the Bavarian site Ried, Neuburg an der Donau; their stratigraphic position can be reconstructed, but there are different chronological interpretations of corresponding loess stratigraphy (Richter *et al.*, 2016; Steguweit , 2011 and references therein).

With all considerations outlined above, a typological assessment is nevertheless provided for the biface from Säckingen, 'Flühwäldchen': On morphotypological grounds, the biface is a representative of the large cultural family of the Upper to Final Acheulean (Le Tensorer, 1998); it is thus older than 60 ka and can be dated either into the Early Würm, the Last Interglacial, or (depending upon the quaternary environment) an older stage of the Penultimate (Riss) Glaciation complex.

The Surface and Edges of the Biface with Traces of Use-Wear

The artifact's surface is of whitish color, due to a very strong patina; the color code according to the Munsell Rock/Soil Color Charts is 10Y8/1 (light

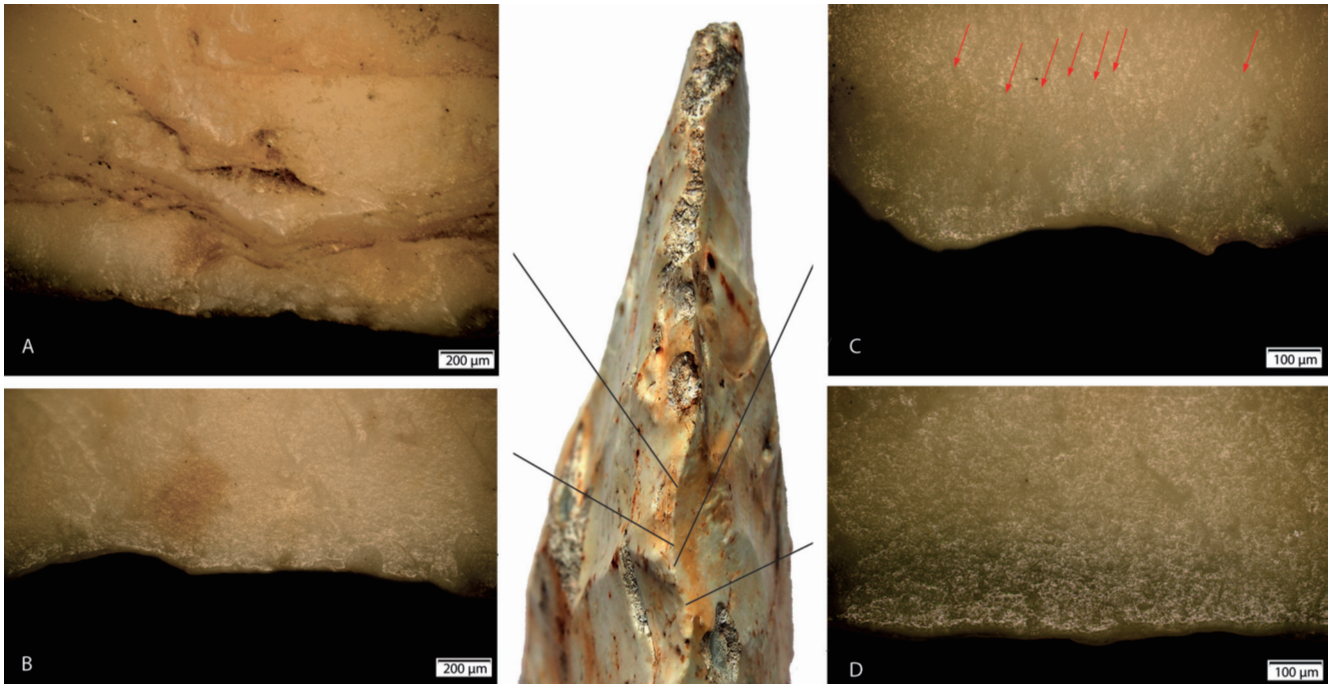

Figure 6: *Better preserved edge of the biface: A- stepped retouches (x50); B- micro-scars visible on one face (x50); C- series of perpendicular striations (x100); D- soil polish and edge rounding (x100) (microphotos: D. Wojtczak).*

gray) to 7.5YR8/3 (light yellow orange). This patina results from the chemical instability of silica which leads to its continuous transformation. The process of evaporation under oxidizing conditions explains the whitish opaque color of the object. The piece must have been exposed on the surface for a time long enough for this transformation to have taken place.

Some arrises on both sides of the biface carry rost-colored stains (10R3/6 to 5YR7/8, dark red until orange; Fig. 3). These can arise from contact with iron agricultural implements such as plows or spades. The artifact must have been redeposited several times in the cultivated soil, as both sides carry these markings.

There are two large orange round patches on one side of the biface (10YR8-7/8, yellow orange until bright yellowish brown; Fig. 3, side without inventory number). They originate from glue residues that must have been applied after the biface's discovery in 1916 and before 1931 when a photo was published on which these patches are already visible (Zotz, 1931). The glue may have been applied for exhibiting the biface in a showcase.

The surface shows a few dark areas of olive gray coloring (2.5GY5/1). Here, the raw material presumably is less affected chemically resulting in a thinner patina.

Remains of cortex are preserved at the base only (Fig. 4 and Fig. 5). The cortex is covered by a tufaceous layer which is of beige or dull-yellow color (2.5Y6/3) and is heavily worn down. The tufa was formed after the deposit of the biface in a loose sediment alternating between wet and dry stages.

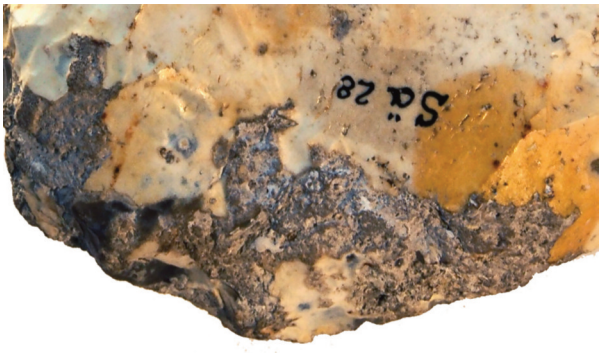

Figure 4: *Base with remains of cortex.*

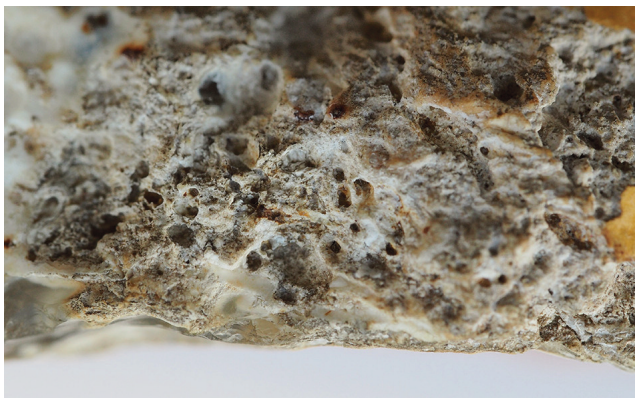

Figure 5*: Detail of cortex.*

The biface exhibits well preserved edges and arrises as well as damaged parts (Fig. 6). The pointed end as well as some edges show modern scratches, leaving behind traces of metal. The damaged areas

are of light color (N9/0 white); they are calcareous and saccharoide which makes them look like cortex: they reveal that the object was strongly affected chemically which underscores its chemical instability. The matrix of the silica raw material will bind to other elements in order to reach a higher level of stability, increasingly so the more amorphous the matrix is (and the less crystalline). With increasing time of deposition, silicas become granulous like chalk in their interior, and lustrous like varnish on their surface.

A microwear study of the biface was conducted, using a Leica stereomicroscope with a magnification of up to 90x and a metallurgical microscope equipped with an optic range from 100 to 500x. Digital photographs were taken and processed with Olympus Stream software. No chemicals, alcohol or acetone were involved in cleaning; the investigated implement was only rinsed in soapy water before analysis. The nature of the raw material can interfere with the identification of microwear traces; however, numerous experiments have been carried out on chalcedony showing that this material preserves traces of use-wear very well (e.g. Plisson, 1984-1986; Aoyama, 1995). Furthermore, recent experiments show that macrotraces revealed on bifaces and their manufacturing flakes can be good indicators of their use (Claud, 2008; Claud *et al.*, 2009). Hence low power analysis (Odell & Odell-Vereecken, 1980) can be used alone or in combination with high power analysis (e.g. Keeley, 1980; Vaughan, 1985).

A few observations were made on the one edge (Fig. 6) of the handaxe which is better preserved than the other: Its ridge is rounded and micro-splintering is rare (Fig. 6B). The flint microtopography is more or less marked by a "soil polish" effect (Plisson & Mauger, 1988) and in some zones by a natural abrasion polish (Mansur-Franchomme, 1986) of undetermined origin (Fig. 6D). This refers to a very localized and random mechanical phenomenon. Natural abrasion can destroy a well-developed micro polish resulting from use (Plisson, 1984-1986), and this seems to evenly occur on almost the whole surface of the studied piece. As for the white patina, the significant chemical alteration considerably hindered the use-wear analysis. Therefore only limited interpretations will be offered and shall be regarded as preliminary.

Detectable last use of the biface appears to be restricted to a small zone of about 3 cm in length (Fig. 3) showing a surprisingly well-preserved stepped retouch (Fig. 6A). This retouch is a succession of several retouching lines developed more or less parallel to the cutting edge. These rows of retouch modified the initial cutting angle. The delineation of the cutting edge produced by this retouch is convex. Yet, the presence of such a type of retouch on a lithic artifact is not coincidental. By retouching an edge we can also by accident obtain a number of scalar and stepped removals, but a retouch of this type can only be achieved by use of a specific method (Bordes, 1961; Lenoir, 1973; Bourguignon, 1996). This can represent an edge which lost its sharpness due to the abrupt retouch and possibly the last resharpening event of the tool. Hence, it seems that this part of the biface was used until it was worn out.

Moreover several thin and long striations are positioned perpendicularly to the edge covered by stepped retouch; the parallel organization of the striations could represent a regular movement (Fig. 6C). Their presence is clear, but because they are partially covered by polish, it is challenging to document them. From this zone forward, the striations disappear. Furthermore, rare unifacial microscars appear; they are semicircular with fine termination and initiation in flexion. Thus it looks like this part of the biface might have been used in transversal motion, possibly for scraping activities and in contact with a semi-hard material.

Raw Material, Depositional Conditions and Geological-Geographical Origin

The raw material of the biface from Flühwäldchen was under study several times. A first published analysis by Fritz Wiegers from Berlin described the stone as a local chalcedony-like raw material from the Upper Jurassic. Similar siliceous nodules are known in the Southern Alsace, as well as in the Swiss Jura (there in the 'terrain à chailles') (Zotz, 1930). Deecke objected and remarked that the 'terrain à chailles' of southern Baden does not carry any silex nodules (Deecke, 1932).

According to Deecke's own petrographic analysis, the stone of the biface is a siliceous sinter which in its interior is pervasively made up of tubes; the two facetted surfaces are imbued with common opal. Upon close observation, thin algae-like threads become visible in the opal; and one spot looks like siliceous wood. It is, according to Deecke, a limnic quartzite. - He provided a similar sample of siliceous sinter with common opal from the Ludien (Upper Eocene) of Montmartre. Such limnic quartzite appears in the Parisian basin in the tufa of Champigny, in the region of the Meulières de Brie and the Meulières de la Beauce, as he noted. A leading fossil in this freshwater limestone is medicaginula Chara Lam. which fit according to Deecke's

judgement with the algae-like threads in the biface of Säckingen (Deecke, 1932).

Zotz reported that limnic quartzite was discovered close to Lörrach, only 25 km west from Bad Säckingen (Zotz, 1939b, footnote 5; Kraft, 1940). Some decades later, Michael Kaiser compared the biface's raw material with the 'limnic quartzite' from the Tüllinger Berg close to Lörrach, but did not find they matched (Kaiser, 2005).

When uncertainties surround an object such as the origin of the biface of Säckingen, new information that may be obtained by re-examining the raw material, utilizing newly-developed scientific methods, is indispensable. For such cases, a non-destructive method was developed in order to avoid the preparation of thin-sections which would be common in geology. The method is based on the identification of the geological depositional environment by use of a stereo microscope with up to 80 times magnification.

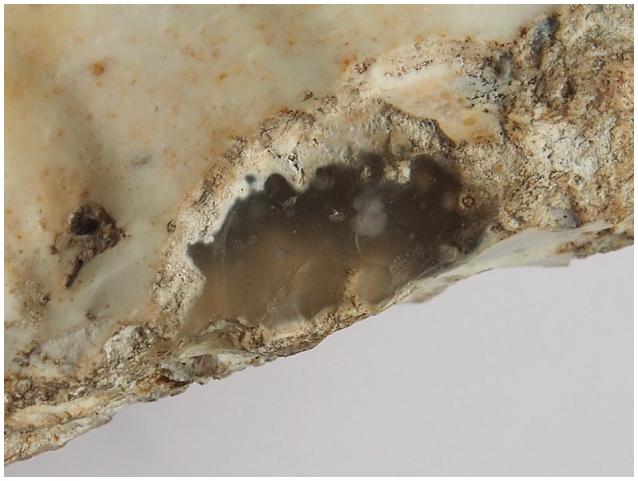

Figure 7: *Unpatinated spot 1.*

Figure 8: *Unpatinated spot 2 (photo: J. Affolter).*

The biface was damaged in modern times in a few small places; these are transparent and more or less olive in color (7.5Y6/3, olive yellow, to 7.5Y4/2, grayish olive, Fig. 7 and Fig. 8). These few unpatinated spots provide the only access into the interior of the material. Under the stereo microscope, the original rock appears colloidal; minuscule crystals and small geodes with larger crystals of quartz swim in this matrix (Fig. 9). In some areas, the matrix is identical to a breccia (Fig. 10) as it usually occurs in paleo soils. Thus, this rock can be called a silcrete to 'limnic quartzite' according to the name given by Deecke (1932). But it is not necessary to go as far as the Parisian Basin to find such varieties of silicites. We know this kind of stone in the Buntsandstein from the southern Black Forest, in the so-called 'Karneol-Horizont', and in the Triassic layer on both banks of the River Rhine.

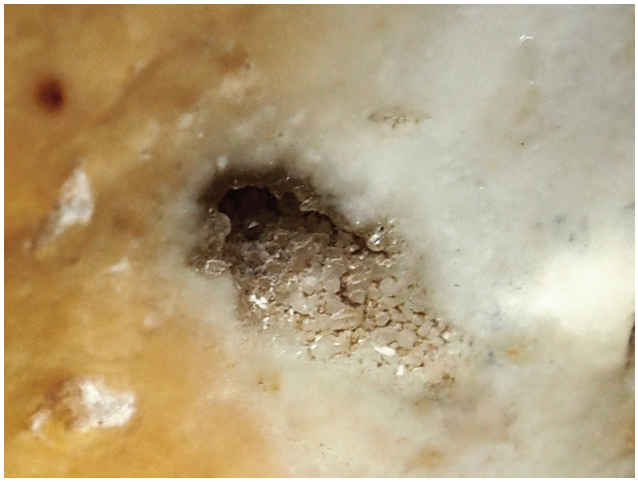

Figure 9: *Geode with quartz crystals.*

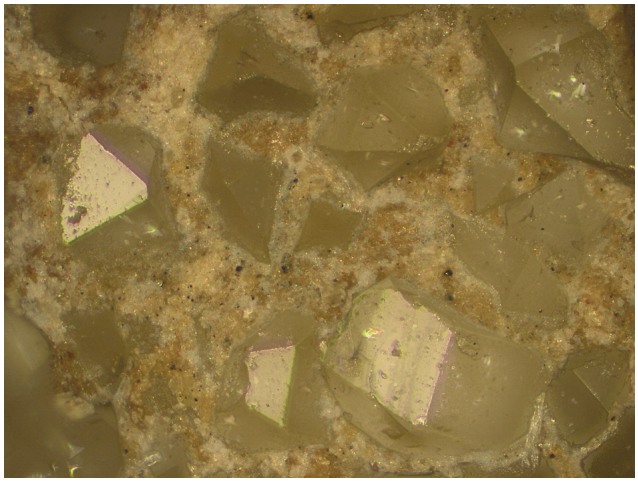

Figure 10: *Detail of the geode with quartz crystals (10x) (micro photo: D. Wojtczak).*

Geographically, small pebbles of the raw material which is also called 'chalcedony' can be found in several places of the Tertiary and Quaternary in North-Western Switzerland. Raw pieces with a size of less than three centimeters mainly originate from such redeposited material whereas larger pieces must rather originate from primary deposits (Sedlmeier *et al.* 2015, 208f.) Because the cortex on the

Figure 11: *Examples of raw material type 652 from Grellingen BL, Abri Wachtfels (Archäologie und Museum.BL).*

Figure 12: *Example of raw material type 652 from Maienbühl, Riehen (former quarry for Buntsandstein).*

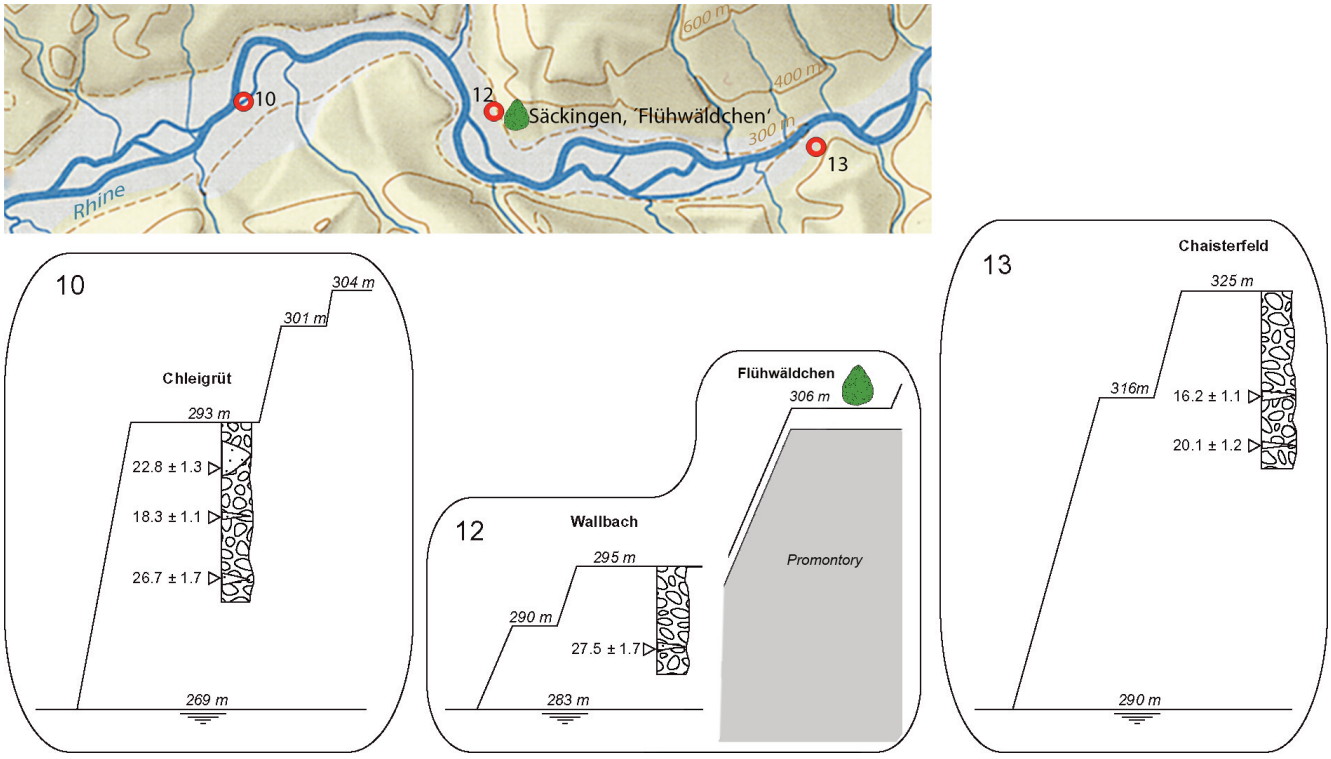

Figure 13: *Selected gravel outcrops, and the vertical distribution within each outcrop of samples with their OSL age. The stratigraphic log represents the available outcrop (depth of the gravel pit), and the stepped plain line represents the different terrace levels in the area of the outcrop, with respect to the modern River Rhine level (Kock* et al.*, 2009). For Wallbach, the terrace level of Flühwäldchen on top of the hard rock spur is amended. The locations of the gravel outcrops are plotted on LGM500 2009 map.*

base of the biface is morphologically fresh and shows no marks of a torrential deposition, one must assume that the raw block was collected very near to a primary outcrop. After the geological map (Villinger *et al.*, 2011), the closest outcrop of Buntsandstein is about 4 km northwest from the Flühwäldchen. So, it actually is a local raw material.

The primary outcrops for the material defined as type 652 can mainly be found north of the River Rhine. One of them, a modern outcrop, is a former quarry for Buntsandstein at Maienbühl, Riehen. A hand-piece of type 652 found within the quarry refers to this primary outcrop nearby (Fig. 12).

Geologically, the material type 652 is a siliclastic rock which develops under terrestrial conditions of a dry and tropical climate. The sedimentary environment reflects a salt pan or a sebkha (as defined by Murawski and Meyer (2010).

The raw material type 652 was not only used for the biface of Säckingen, 'Flühwäldchen', but was also knapped in later periods. It is identified in archaeological sites such as Abri Wachtfels (Fig.11) and others (Sedlmeier *et al.*, 2015).

With this new result - the raw material of the biface Säckingen, 'Flühwäldchen' being of local origin - the next question comes into focus: can the geological location of the biface be plausibly made compatible with its archaeological age?

Quaternary Environment of the Biface's Location

The biface Sä28 was found, northwest of the town Bad Säckingen, in the district 'Flüh', at the Northern edge of a forest called Flühwäldchen on a pile of stones which were gathered from the adjoining field Weihermatten (Fig. 1). The altitude of the find spot is 306 m a.s.l. The find spot is located on a terrace 23 m above the average level of the River Rhine (or 34 m above its river bed) (Haldimann *et al.*, 1984). The geological unit indicated on geological maps is given as 'Lower Terrace gravel' (Hincke & Piepjohn, 2004) or as 'Würm gravel' (LGRB GÜK 300). According to Hantke (1978), Fig. 131, the find spot is located on the crystalline basement of the Black Forest. The terrace is in fact part of a promontory of the southern Black forest that extends southwards into the Rhine valley. The promontory is formed from crystalline bedrock (mainly gneisses, granites) and Permian clastic (Becker & Angelstein, 2004) and is covered in the area of the find spot by 3 to 7 m of quaternary deposits. According to Zotz (1930), a thin layer of top soil amounting to 20-30 cm covers 'alpine gravel' underneath.

Latest research efforts focused on a better chronological understanding of the Lower Terraces of the High Rhine valley (Kock *et al.*, 2009). Sedimentological and morphological data show that the Late Pleistocene gravels (of the Lower Terrace) were deposited as a braided river and eroded into a meandering river system, where flood events played a major shaping role. The flood deposits are mostly conserved on top of the different terrace levels because the general incision regime prevented them from being reworked. OSL ages show that the Lower Terraces were deposited during two periods (30-15 ka and 13-11 ka). These periods correlate with two cold climatic phases, representing the Last Glaciation of the Alps and the Younger Dryas.

Among the 13 gravel pits investigated by Kock *et al.* (2009), the gravel pits of Wallbach, of Chleigrüt and of Chaisterfeld reveal relevant information for the biface's location. The gravel pit of Wallbach is located within a distance of 1 km only, whereas the other two are approx. 9 km away, east and west of the find spot (Fig. 13).

The highest accumulation level of the Last Glaciation is not equally preserved on the left and right side of the High Rhine River. On the right side, it is largely eroded (Wittmann, 1961), also in the area of Bad Säckingen (Haldimann *et al.*, 1984). On the left side, however, the highest level south of Chleigrüt and of Chaisterfeld is identified at +35 m each above the modern River Rhine level. Following the concept of a braided river system across the valley, corresponding highest gravel accumulations can be reconstructed for the right side of the River Rhine. At Wallbach and Bad Säckingen, this highest gravel accumulation level must have reached an altitude of around 318 m (283 m + 35 m). In fact, this is approximately the altitude above which loess loam is preserved in the area (Hincke & Piepjohn, 2004). The distance between the biface's location and the loess loam limit is 380 m.

The altitude of the find spot is 306 m, 23 m above the River Rhine level only, which implies that the location must have been covered by floodplain sediments during the Last Glacial, with gravels starting to accumulate after 30 ka. The plain was later eroded and a terrace was formed when the River Rhine moved its bed south around the hard rock spur to its modern position. Today's river course east and south of Bad Säckingen follows more or less an older pleistocene trough which may have formed after neotectonic tilting, as suggested by Haldimann *et al.* (1984).

On the basis of the vertical location of the OSL samples in Fig. 13, the valley floor around 30 ka (and before) can be reconstructed with reference to the Flühwäldchen and the modern River Rhine level: in all three gravel pits, the dates of the deepest samples imply that before gravels started to accumulate, the valley floor was lower than the hard rock spur with the find spot. The promontory Flüh west of Säckingen must have been exposed and accessible.

With the following preliminary statements, a sketch of the locality west of Säckingen is given which needs further in-depth study and geological expertise. The rock spur was probably exposed between 30 ka and 130 ka, the latter being the boundary between the penultimate glaciation (OIS 6) and the last interglacial (Eem or OIS 5e). Most likely the promontory was not accessible during the cold peak of OIS 6. It was covered - not by an alpine glacier - but by a glacier from the Black forest reaching down the Wehra valley and crossing the River Rhine valley. Evidence of a till with a diamicton originating completely from the Black Forest is witnessed at the gravel pit Bünten close to Zeiningen and by erratic boulders mostly from same origin along the escarpment of the Möhlinerfeld. The glacier of the 'Zeiningen advance' left a till, shaped as a bent bank, across the Möhlinerfeld (Müller-Dick, 2000; Graf, 2009; Preusser *et al.*, 2011). The bent extends to the Flüh and the find spot.

For the biface of Säckingen, 'Flühwäldchen' a scenario for its maximum age from a geological view-point is proposed - to be confirmed or rejected by more in-depth geological expertise.

An assumption is that the biface was not transported from far away to the Flüh. It must have been embedded on the promontory in a way that protected it during the last Glacial from high-energy flood events, possibly by the spur of Galgenbuck or by some clayey-silty sediment (as documented in drill cores from the Flüh). Before, Neanderthals settled on the promontory. Their stay must have taken place after the Penultimate Glaciation, i.e. after the glacier from the Black Forest down the Wehra valley had retreated. This would include the Last Interglacial of OIS 5e as well as the stadials and interstadials of OIS 5d to OIS 4. After 130 ka the promontory 'Flühwäldchen' was ice-free and potentially accessible. In case the Flüh was not affected by the glacier of the Zeiningen advance, an even older age than OIS 5e could be envisaged, as the prior glaciation reaching the area would be the Most Extensive Glaciation (MEG).

Conclusions and Suggestions for Further Research

The research history of the biface Säckingen, 'Flühwäldchen' reveals controversial positions taken about an exceptional palaeolithic object. At the time of discovery the raw material identified was not known in the region and no comparable biface had been found in Germany.

A new analysis of the raw material now reveals its very local origin. A search for the same type of material in other middle palaeolithic assemblages of the region (such as Murg) may reveal interesting connections and use of lithic resources in the landscape.

Despite the biface's heavy patina, a soil polish and another form of natural polish of the surface, a microwear analysis reveals that the biface shows traces of a very specific stepped retouch. It might have been used for an activity which left behind fine parallel striations; furthermore the biface was potentially used for scraping or for working some semi-hard material.

A morphotypological assessment of the biface, together with scenarios for the quaternary environment of its location suggest an age of between OIS 4 and OIS 5 (60 ka and 130 ka), possibly older. With a more in-depth study of the geological situation, this chronological suggestion may be confirmed, rejected and/or revised. Moreover, the quaternary history of this part of the High Rhine valley could be complemented.

The biface of Säckingen, 'Flühwäldchen' is a flat almost symmetrical biface. The symmetry is not necessary for the tool to function; it may be an esthetic complementary (Le Tensorer, 2001). Was the object made as a tool for cutting, scraping, leveraging, or was it also an accomplishment of a gifted knapper who followed some stylistic ideals? The artifact might have been shared or traded with another person to use, to resharpen, to appreciate. The biface of Säckingen, 'Flühwäldchen' caught the attention of a young girl who had no previous knowledge about 'palaeolithics'. The biface conveyed something that is perceived non-verbally, still today.

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