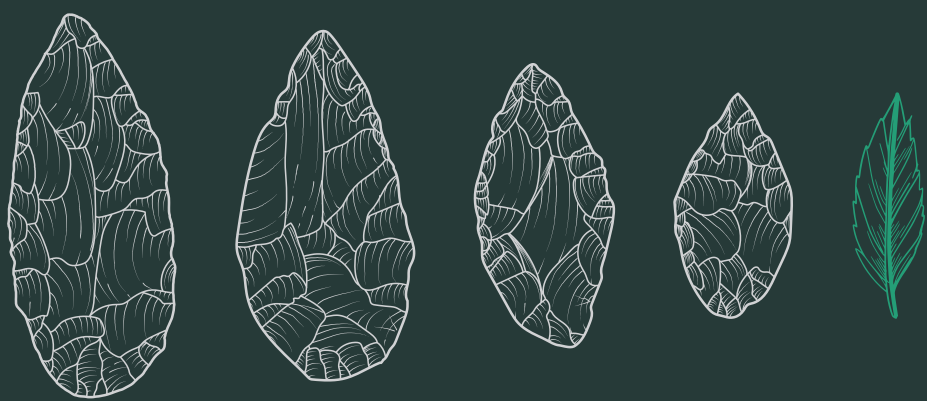
From tea leaves to leaf-shaped tools

STUDIES
IN HONOUR OF ZSOLT MESTER
ON HIS SIXTIETH BIRTHDAY



EDITED BY
ATTILA KIRÁLY

LITIKUM KÖNYVTÁR 2

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Editor:
Attila Király

ELTE
EÖTVÖS LORÁND
UNIVERSITY

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2023

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CONTENTS

13

If these stones could talk – An attempt to enlighten a four-variable archaeological problem

TWO MACRO-BLADES FROM PARABURDOO (PILBARA REGION, WESTERN AUSTRALIA)

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Abstract. The following article presents two chipped stone blades held by the author. The blades, in the company of other chipped lithic artefacts, were sold at the International Mineral Exchange in Hamburg in the mid-1990s. There was an accompanying notice to the blades, with additional information in incorrect German language: "*Aboriginals Artefakten Jung Paläolithikum 15.000 bis 9.500 v, Chr. Steingeräte mit typische Levallois technique (abschläge) - F.O. UA. DINGO POOL bei PARABURDOO in Nord West Australien nach A. Wouters 1989.*" However, there are several vague questions about both the supposed archaeological site and the reference to a person named A. Wouters and the so-called Levallois technique cited. Below we will try to take a closer look at these details.

Keywords: Western Australia, "Leilira" macro-blade, Basalt

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"What matters is the work, not the author who happened to write it; I would say rather that it writes itself through him. The individual person is no more than the means of transmission and survives in the work only as a residue."
Claude Lévi-Strauss (1908-2009)

1. Who was the person A. Wouters?

Due to the archaeological aspect of the subject, practically only one person can be considered as a candidate.

Adrianus Maria (Ad) Wouters (Tilburg, January 16, 1917 - 's-Hertogenbosch, June 17, 2001) was one of the best-known and well-respected amateur archaeologists from the Netherlands. At a young age, Wouters entered as 'brother Aquilas' into the Brothers of Charity in Eindhoven. Before World War II, Wouters and the Reverend A. P. van der Vlugt from Drunen searched for flint tools in the Drunense Duinen. After the war, from 1949 on Wouters became involved in archaeology again; searched for flint tools in Limburg and discovered various archaeological sites. This brought him into contact with the Dutch archaeologist Assien Bohmers (born as Johan Christiaan Böhmers, first name also: Azzien, last name also Bommers, Böhmers or Bëmmers; 1912, Zutphen – 1988, Göteborg). In 1954, Wouters assisted Bohmers with excavations and collected more flint tools in Brabant. He published some papers under his name (see, for example, Wouters, 1955, 1957) and several important papers with Bohmers (e.g., Bohmers & Wouters, 1954, 1956, 1962). The ultimate goal, together with Bohmers, was to produce a survey of sites from the Paleolithic and Mesolithic periods for the Netherlands and Flanders. Because of Bohmers' suspension and dismissal in 1962, this has never appeared. After Bohmers had resigned, Wouters withdrew from the archaeological world. In 1975 the Drenthe amateur archaeologist Tjerk Vermaning (1929, Staphorst, Overijssel – 1986, Assen) was charged with forgeries. The accusations were made by the province of Drenthe, based on the findings of the archaeologist professor Tjalling Waterbolk and his associate Dick Stapert of the University of Groningen (see, for example, Stapert, 1975a, 1975b, 1982, 1986, 1992; Stapert *et al.*, 1998). When the lawsuit against Vermaning was appealed, Wouters returned to archaeology and was part of the defence; he provided evidence for the authenticity of the finds. In 1977 Wouters founded the magazine *Archeologisch Berichten* with Caspar Franssen, in which many articles about Vermaning and his findings were published (see, for example, Wouters, 1980, 1982a, 1982b, 1983, 1984, 1990a, 1990b, 1991). In the magazine, he also published archaeological discoveries from the moraines and many sites that he originally wanted to publish with Bohmers. There is considerable doubt regarding numerous finds and sites published by Wouters (see, for example, Maas, 2009; Deeben & Schreurs, 2012; Boomsma, 2018; Niekus *et al.,* 2019). However, the assessment of some of the archaeological finds published by Wouters is controversial. Among these artefacts, a decorated, broken bone retoucher (the so-called 'Venus of Geldrop') should be mentioned, which was discovered at the Late Upper Palaeolithic (Ahrensburgian) site of Geldrop (province of Noord Brabant) (Bohmers & Wouters, 1962). The authenticity of this anthropomorphic engraving has been the subject of intense controversy. In a study, Leo Verhart and Francesco d'Errico (2012, p. 365) concluded that there are no indications to suggest a forgery. On the contrary, results strongly suggest that the Geldrop pebble is an authentic prehistoric retoucher.

A possible connection of Wouters to archaeological objects of Australian origin – if such existed at all - can be traced back to years after World War II. Then artists became increasingly interested in ethnographic objects, especially from Africa and New Guinea. Wouters was living in the mission house in Roermond, where a lot of ethnographic objects were stored in the attic, having been brought here by different missionaries over the years. Wouters started to transfer part of this collection to Joep Thissen (Joseph Alphons Maria Thissen, 1919, Roermond – 2010, Roermond) an amateur archaeologist and artist. However, after a few years, he asked for the objects to be returned because the congregation had discovered that some of them were missing.

There are at least three possible explanations for the origin of the lithic artefacts offered for sale in Hamburg at the Mineral Exchange. The lithic finds may have come from the private collection of Wouters, – if he had any – acquired by him from the mission house. They may have been from artefacts passed by Wouters to Joep Thissen, who wanted to get rid of them before his death. Ultimately, however, it is not ruled out that Wouters only provided a professional opinion on the lithic finds offered for sale by a merchant without archaeological expertise. The German term "*nach A. Wouters 1989*" may refer to a publication of Wouters from 1989, about which, however, we do not know. It can also refer to a personal statement made by Wouters. The latter explanation is more likely. On the whole, the part of the story about the origin of the lithic finds is unclear and cannot be explained.

Although the origin of the finds is unclear, based on "Occam's razor principle of simplicity", in the following we start from the assumption that the finds come from the Paraburdoo area of Western Australia.

2. The description of the artefacts

In Fig. 1, in the lithic illustration, the so-called French system was applied (see, for example, Inizan *et al.,* 1999, p. 108, Fig. 42). Below is the proximal part of the artefact. The views in turn are the right edge, upper (dorsal) face, left edge, and lower (ventral) face. Both artefacts are blades, in a simplified sense that the length of the artefact is at least equal to twice its width. For the measurement, the so-called "box method" was used (Debénath & Dibble, 1994, p. 19), by taking the maximum length and width measurements (Dogandžić *et al.,* 2015, p. 7, Fig 3b). The maximum length represents the distance from the point of percussion to the distal end, following the axis of percussion (the debitage axis *sensu* Inizan *et al.,* 1999, p. 138) (perpendicular to the striking platform width). Maximum width is taken at the widest point perpendicular to the length axis, and maximum thickness is recorded at the thickest point along the third dimension.

The blade in Fig. 1: 1 (B1) is asymmetric to its longitudinal axis; the lateral edges are not parallel. The proximal end of the left lateral edge is almost straight; the right lateral edge is rather curved. On the upper face, two arrises are visible, so the blade has a sub-trapezoid cross-section. The side profile is slightly S-shaped and curved. The straight-lined right arris runs up to the right part of the tipped distal end of the blade, which is covered by the cortex, the weathered natural surface of the core. The left arris is leftward curved; it is the right margin of a large-sized previous removal. The striking platform is unprepared, and there are no traces of either dorsal reduction (small flake removals) or abrasion. The butt is flat and has an amorphous, trapezoid-like shape. Its measures are 20.5 × 10.4 mm. The bulb is flat and imperceptible. The dimensions are 81.4 × 32.6 × 12.7 mm.

The blade in Fig. 1: 2 (B2) is strongly bent towards the right. The rightward curved lateral edges are not parallel. On the upper face, a Y-shaped arris is visible; the legs are the margins of a previous small flake removal. On the whole, the blade has a sub-triangular cross-section. The blade is somewhat twisted and has an almost straight side profile. The arris runs up to the oblique distal end of the blade, which is covered by the cortex. The striking platform was unprepared, and

Figure 1. The discussed macro-blades. Prepared by the authors.

there are only minimal traces of dorsal reduction. The butt is flat and has an approximately "*en chapeau de gendarme*" shape. Its measures are 26.4 × 7.8 mm. The bulb is diffuse. The dimensions are 96.6 × 31.1 × 11.2 mm.

From a technological point of view, the blades suggest the possible use of the "direct percussion with a hard hammer" technique. However, it should be noted that when the "direct percussion with soft hammer" technique is applied, the detached artefact may happen to remove a larger amount of material in the butt area. As a possible result, the proximal part shows a very broad butt (blade/flake platform). Platform thickness, which is measured from the interior to the exterior surface of the platform at the point of percussion, is an independent variable in flake formation because it is controlled by the knapper. It is highly correlated with maximum flake thickness (Speth, 1981, p. 17). The exterior platform angle (*angle de chasse*), the angle between the butt and the upper (dorsal) face is acute. Its values are 82° and 69°, for the blades B1 and B2 respectively. The interior platform angle (flaking angle, *angle d'éclatement*), the angle between the butt and the lower (ventral) face is obtuse. The corresponding values are 105° and 118°, for the blades B1 and B2 respectively.

The edges of the blades are not worn or rolled, but along the edges, there are traces of some kind of observable damage. These edge damages have a "cryoturbation retouch" impression, which can strongly resemble an artificial retouch. Dick Stapert mentioned several distinctive characteristics: '*…in the case of natural "retouch" small "teeth" often develop along the "retouched" sides. Alternating retouch is also often present*' (Stapert, 1976, p. 29). Both blades have smooth, glossy surfaces. Gloss patina is a natural post-depositional surface alteration. The gloss is a shiny surface condition, which can have natural origin such as water, wind, friction due to vibration, etc. Both blades have a cortex near the tip; it is likely these are core reduction blades removed in the process of creating a more serviceable blade (point), not as projectile (spear) points but would have been used as cutting tools.

For long macro-blades, the most common term in Australia is "*leilira*" (see, for example, Akerman, 1976a, 1976b, 2007; Hook, 2009; Moore, 2003a, 2003b; Tibbett, 2006). The term "*leilira*" derives from the Arrernte (sometimes referred to as Aranda, Arunta or Arranta; a group of Aboriginal peoples who live in the Arrernte Lands in Central Australia) name for resin-hafted knives. There is a frequently cited definition of the term by Frederick D. McCarthy (1976, p. 35): "*The leilira is either a long pointed blade triangular in section, or an elongate rectangular blade trapezoid in section. The striking platform is plain and high angled. The lateral margins may be trimmed, frequently at the butt end only and often up to the point. This trimming may extend to a central or lateral ridge and have some flat outer surface with a ridge on each side. The distal end is trimmed or plain point but it may be an oblique thin edge. They range in size up to 8 inches long [20cm] … The leilira is used for cutting up animals, cutting cicatrice scars, circumcision and subincision on men and introcision on women*." There is a dispute regarding the function of these blades, although, according to some scholars, this term should be restricted to those blades hafted as knives (see, for example, Casey *et al.*, 1968). Based on the first use of the term for macro-blade (Spencer & Gillen, 1968 [1899], p. 652), Kim Akerman (1976b, 2007) suggested that the name should only be used to refer to blades made of quartzite or silcrete and their length exceeds 120 mm.

In Fiona Hook's paper, in Table 1. (2009, p. 25), there are measurements for Paraburdoo macro-blades. As regards the 66 measured dolerite blades, the mean values of length, width, and thickness are 71.1 mm, 26.6 mm and 9.2 mm respectively. The mean platform width and thickness are 15.8 mm and 3.8 mm. Among the metric data, only the length has a relatively high standard deviation of 24.7. Based on these data, the studied Paraburdoo blades are somewhat shorter, narrower and thinner than the two discussed blades.

In Fig. 2, the geographical distribution of macro-blades is represented after the relevant literature available.

The list of the sites is the following: 1) Oodnadatta (Horne & Aisken, 1924), 2) Quondong Point (Akerman, 1976a), 3) MacDonald Downs (Binford & O'Connell, 1989), 4) Camooweal (Moore, 2003a), 5) Burke River, 6) Lawn Hill, 7) Moondarra, 8) Selwyn Range, 9) Toko Range (5–9 after Roth, 1904, see also, Tibbett, 2006), 10) Chichester Range, 11) Dampier Land, 12) Devil's Lair, 13) Hall's Creek, 14) Ingaladdi, 15) Lake Argyle, 16) Millstream Station, 17) Puntutjarpa rock shelter, 18) Koonalda Cave (10–18 after Dortch & Bordes, 1977).

3. The raw material

The Hamersley Range is a mountainous region to the north of the mining town of Paraburdoo (WGS 84: -23.201 S, 117.671 E; UTM: 50K 568664 7434071) of the Pilbara region of Western Australia, which consists of a series of ranges, ridges, hills and plateau. The Hamersley Range extends east-southeast for 260 km south of the Fortescue River. Part of an ancient (Archaean–Proterozoic, 3,600–545 mya) tableland broken by faults and gorges. The range includes the highest peak in Western Australia, Mount Meharry (1,253 m) and terminates in rocky headlands and coral islets in the Indian Ocean. The immense quantities of modified iron and silica-rich precipitates make up the present iron formation. In the banded formation, veins of quartzite, dolerite, shale, chert, quartz, basalt, granite and silicified tuffs are found (Morris & Horwitz, 1983; Morris, 1993; Tyler, 1991; van Vreeswyk *et al.*, 2004; McKenzie *et al.*, 2009; Semeniuk & Brocx, 2019).

Unfortunately enough, because of the patinated surface, not even the original colour of the raw material of the discussed macro-blades can be determined with certainty. It has a fine-grained homogeneous structure. Based on a macroscopical examination made with the naked eye, the most likely raw material of the two discussed blades is some kind of volcanic rock.

Based on several archaeological field surveys at the southern edge of the Hamersley Plateau, Fiona Hook (2009) gave a detailed description of the manufacture and distribution of macro-blades in the Paraburdoo area of south-central Pilbara. Although in the region of the Hamersley Plateau, there are various volcanic, sedimentary and metamorphic rocks as potential lithic raw materials with good to excellent flaking qualities, because of their high numbers, Hook focused on dolerite and banded iron formation (BIF) blades.

According to Hook (2009, p. 25, Fig. 6), northeast to Paraburdoo, in the Bellary/Considerable Creek, dozens of archaeological sites were localized. At most of the sites were dolerite macro-blades found.

Le Maitre and colleagues (2002, p. 74) defined dolerite as a rock, which is intermediate in grain size between basalt and gabbro and composed essentially of plagioclase, pyroxene and opaque minerals; often with ophitic texture (where pyroxene or occasionally olivine forms larger crystals and typically contains numerous crystals of plagioclase). In Figure 3 of Hook's paper (2009, p. 24), the raw material of the illustrated macro-blade of graphite colour seems to be also rather medium-grained. In the Ph.D. dissertation of Wendy Reynen, there is a photo of local dolerite from the Pilbara Uplands (2019, p. 275). It is described as a medium-grained subvolcanic rock with a conchoidal fracture. The illustrated raw material chunk has a greenish-grey colour and a rost-brown cortex.

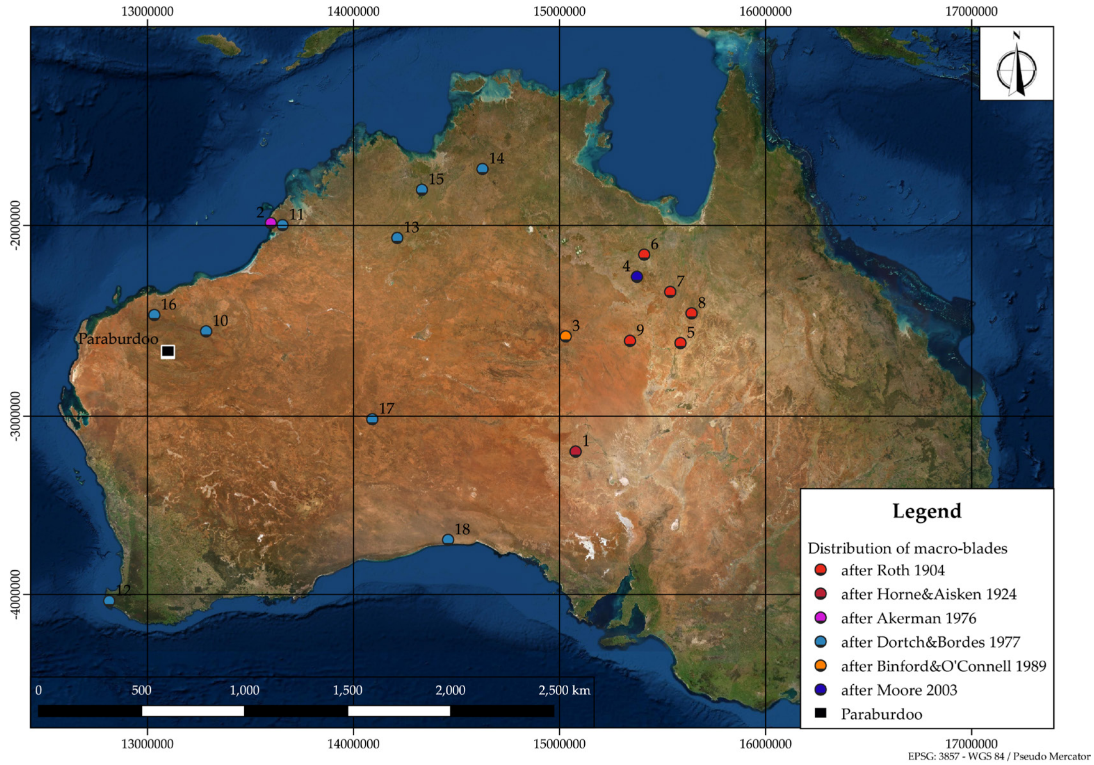

Figure 2. Geographical distribution of macro-blades in Australia. Prepared by the authors.

Among the above-mentioned broad range of lithic raw materials, by process of elimination, fine-grained basalt seems to be the most probable. Basalt is a dark-coloured, fine-grained, igneous rock composed mainly of plagioclase and pyroxene minerals. It most commonly forms as an extrusive rock, such as a lava flow, but can also form in small intrusive bodies, such as an igneous dike or a thin sill. It has a composition similar to gabbro. The difference between basalt and gabbro is that basalt is a fine-grained rock while gabbro is a coarse-grained rock.

4. The site

The designation of the location where the artefacts came from is F. O UA. DINGO POOL at Paraburdoo in Northwestern Australia ("... *bei Paraburdoo in Nord West Australien*", in German). For the time being, there is no possible way to interpret the somewhat enigmatic abbreviation F. O UA. before the assumed archaeological site name of DINGO POOL. Theoretically, F. O can be the abbreviation of the German word "Fundort" (meaning "find site") but is rather a vague hypothesis. The exact locations of archaeological sites are protected information in Australia as well. Of course, it is doubtful whether "Dingo Pool" is an archaeological site at all. In a dry, partially semi-desert area like the Pilbara region, a geographic name with the ending "pool" may seem quite common. There are several such geographical names on the 1:50,000 scales topographic survey map of Bellary

Creek. According to the legend, "pools" indicate a tank or small dam or waterhole.

According to the accompanying paper with the macro-blades, the assumed age is 11–12,000 years. If the discussed macro-blades indeed came from the environment of Paraburdoo then this assumed age is more than questionable. In the paper of Bruce Veitch and colleagues, there are radiocarbon dates from the Paraburdoo, Mount Brockman and Yandicoogina areas of the Hamersley Plateau (2005, p. 60, Tab. 1). No surface sites have even an approximate radiocarbon date. A large rock-shelter (Yirra, CME-A-31, Channar Ranges, south-east from Paraburdoo) has the oldest dates, which vary between 16,950 ± 90 BP and 19,270 ± 140 BP from a depth range of 38.63 and 55.80 cm below surface respectively. Fiona Hook (2009, p. 28, Tab. 2) published some radiocarbon dates for blades in the Pilbara region. The oldest date is connected to the Newman Orebody XXIX geological unit (9,870 ± 80 cal BP) and the Newman rock shelter (3,740 ± 100 cal BP to 6,270 ± 210 cal BP) (see also, Slack *et al.*, 2018, p. 5, Tab. 2). Based on the archaeological evidence of the other much more recent dates, the macro-blade production occurred after 3,000 years ago with a dramatic increase after 1,300 years ago.

5. The technology

François Bordes (1967, p. 28) was the first in the archaeological literature who dealt briefly with the issue of macro-blades of Australian origin. He referred to the classic ethnographic work of Baldwin Spencer and Francis J. Gillen (1966 [1927]) and in connection with the illustrations Fig. 192–200 and 202–209, stated that the shown pointed blades are long Levallois points or pointed blades ("*pointes Levallois allongées ou des lames pointues*"). Charles E. Dortch (1972) described the lithic material of rich archaeological sites in Western Australia on the southern slopes of the Chichester Range on the north side of the Fortescue River. Among the collection of artefacts, the large, finely manufactured "leilira" type pointed blades were dominant.

The used lithic raw material was an extremely fine-grained cherty siltstone, a clastic sedimentary rock (Haldar, 2020, p. 220). According to Dortch, the pointed blades or points have been manufactured by the same form of prepared core technique which has been described in the ethnographic literature by Walter E. Roth (1904, pp. 16–18) and Spencer and F. J. Gillen (1904, pp. 641–648). The essence of the technique is briefly that two or more preparatory blades or flakes from a properly prepared core stone are removed in such a way as to cause the projected target blade to have more or less convergent lateral edges and a pointed distal end. As regards the flakes in the assemblage, most of them are thick, broad specimens with broad butts. The interior platform angle (flaking angle), the angle between the plane of the butt and the lower (ventral) face is generally wide. There are also some flakes with centripetal faceting on the upper faces. Regarding the assemblage, Dortch stressed that there are only some cores that substantiate the similarities to the Levallois technique and therefore it is necessary to examine a larger collection of cores.

The Western Australian stone industrial sequence has been separated into an earlier and a later phase (Dortch & Bordes, 1977). While there is no certain evidence for blade technology in the earlier phase, during the later phase, blade techniques were applied where suitable lithic raw material was available. In parts of the Kimberley and the Pilbara regions, the Levallois techniques appear to be confined to the later phase. To substantiate the importance of the Levallois techniques, the authors gathered the available information and discussed many significant lithic assemblages. Based on the examination of the lithic material, they suggested two techniques to make points and blades of the "leilira" type. The prismatic blade technique is based on the preparation of the core flaking face for successive blade production. The preparation consists of the following steps, 1) the removal of a natural ridge from the edge of an angular block of stone, 2) the creation or improvement of a natural crest or ridge by unilateral or bilateral flaking, and the removal of a crested blade, 3) removal of adjacent flakes (or blades) to form a central ridge as in the Levallois point technique.

The Levallois point technique was used often on cores that were re-prepared after the removal of the first point or points. The application of the two techniques seems to be dependent upon the available raw material. In general, typical prismatic blade cores were made on angular quartzite raw material blocks, whereas typical Levallois point cores were often made on chert (flint) and fine-grained quartzite or basalt. Given the fact that angular lithic raw materials blocks often have natural longitudinal ridges, which may after slight modification guide the first blade (Bordes & Crabtree, 1969, p. 3), the raw material dependency of the used technique is self-explanatory. In the discussion of their paper, the authors referred to personal communication with Kim Akerman. According to Akerman, in Dampier Land (Western Australia), symmetrical points were sometimes made by the true Levallois technique. Three preparatory flakes (or blades) were removed to produce a "second-order Levallois point" *sensu* Bordes (1961, pp. 18–19).

Kim Akerman (1975) published a description of the archaeological remains of aboriginal sites on the Dampier Land Peninsula, Western Australia. The lithic industry used local silcrete, "*a silica-rich duricrust, an indurated, or hardened layer in or on a soil*" (Taylor & Eggleton, 2017, p. 1). As Akerman noted, the most striking feature of the lithic industry is the refined production technology that has produced long blade points with some marginal trimming. Akerman referred to a similar industry in the Chichester Range, described by Dortch (1972, pp. 65–72). In his conclusion, Akerman stated that during the three major cultural phases in the prehistory of Dampier Land, the bifacially worked spear points were never important implements. The relatively short (3 to 12 cm long) blade points of the cultural Phase 2 were used possibly as knives. Among the lithic artefacts from the site Quondong Point on the Dampier Land, Akerman (1976a) carried out the morphometric analysis of a small collection of blades manufactured from silcrete. The mean dimensions (length, width and thickness) of the 24 examined blades are 95.71, 39.3 and 12.66 mm respectively. The butt of the blades was usually cortical or plain, suggesting that the blades were struck likely from unprepared cores. Interestingly enough, except for one blade, all others were backed blades having either a cortical or a natural back, which made the blades very suitable to use as knives. Akerman noted that the tools made of the very brittle silcrete used in the Dampier Land would have been highly unsuitable for working activities with resistant materials such as wood or bone. However, they were excellent tools for the butchering of prey games such as wallaby, dugong or turtle.

After gathering the data on ethnographically recorded uses of long blades and points and examining the available lithic artefacts, Akerman made experiments for blade production and described the suggested experimental manufacture (1976b). During the reconstruction of the manufacturing process, despite the lack of accurate technological details, which are important to the production of the blades, Akerman took into consideration several descriptions from the ethnographic literature (Roth, 1904; Spencer & Gillen, 1904; Spencer, 1928). Since most of the ethnographic specimens were manufactured from orthoquartzites of varying degrees of grain site, for his experiments, Akerman used fine to medium-grained orthoquartzite.

While blades made from orthoquartzite have a straight almost flat lower (ventral) face, fine-grained and cryptocrystalline materials tend to produce blades considerably more curved longitudinally. From the applicability point of view, an important feature of the orthoquartzite blades is the micro-serrated nature of the edge, which is well suited for butchering works or hunting activities. Spear wounds made with such blades cause serious internal damage and result in massive internal haemorrhage. The micro-serrated edge is caused by the fracturing nature of orthoquartzites, which have not undergone a metamorphosis. The quartz grains are interlocked and hardened by a cementing process. The fracture happens along the internal cement interstices between individual quartz grains and in the case of fine-grained orthoquartzites without internal flaws, a more or less conchoidal fracture can be achieved (Whittaker, 1994, p. 72; Andrefsky, 1998, pp. 54–55; Seong, 2004, p. 77). In the paper written by Roth, apart from the description of the manufacturing (Roth, 1904, pp. 16–18), his diagrams and especially his two figures (Roth, 1904, Plate III, 23–24) are important. These figures show the used hammerstone and how the raw material block to be worked was held in the hand and on the whole suggest the application of the “direct percussion with a hard hammer” technique. Since successful flaking depends on the weight of the hammerstone rather than the applied force of the blow, for the technique developed, Akerman used basalt or dolerite cobbles of weight varying between 0.5 and 1.0 kg. The preparation of the block has been described diagrammatically by Spencer (1928, p. 504, Fig. 351). Two large primary blades were struck from one end of the block so that their resulting flake scars intersect to form a median ridge. Though Spencer has not explained, through the removal of these blades the correct angle between the flaking face and the striking platform can be established. Akerman stated that the technique which is from a technological point of view similar to the Levallois point technique produces a potential flaking surface that is properly angled to a pre-existing unprepared platform area. As a consequence of a correctly performed removal of the two primary blades, the line of the two intersecting flake scars forms a correct acute angle to the striking platform. This line will be the median ridge on the upper face of the intended blade.

In the paper of Akerman (1976b, pp. 125–126, Fig. 1–11), blades made by him have been represented. The length varies between 10 and 17 cm, and the width of some chunky blades is about 5 cm. Morphometric measurements were carried out on 24 blades. The exterior platform angle ranged between 64° and 84° with a mean value of 72.7°. The interior platform angle ranged between 98° and 110° having a mean value of 106°. According to Akerman, the use of cores with angles outside the given range reduces the likelihood of regular blade production by the applied technique. Most of the represented blades show traces of the removal of the projections (overhangs, see, for example, Inizan *et al.*, 1999, p. 147), which can be done by rough abrading with the hammerstone or by fine flaking about the negative bulbs of percussion. The removal of the projections defines the butt of the intended product. Akerman emphasized the essential importance of the force with which the intended blade will be struck. If the blow is too forceful, the blade will carry right across the core to the base and possess parallel to sub-parallel lateral edges. If the blow is not heavy enough, the blade will hinge out when the force has been expended. Such hinges or step flaking may spoil the core. A satisfactory blade, which is suitable to be used as a spear-point, should have converging edges terminating on the median ridge forming a point. The attributes of the point will be controlled by the thickness of the blade and the angle of intersection of the primary blades removed. Very obtuse angles result in flat blades with fine, sharp lateral edges; on the other hand, if the angles are acute or at right angles, the blades will have a more equilateral section. Akerman concluded that the experimental blades are similar in shape to the ethnographic blades and bear the same morphometric characteristics. This fact would suggest that the same manufacturing technique has been employed.

During his ethnoarchaeological fieldwork near the cattle station MacDonald Downs, Central Australia, Lewis R. Binford studied and described in detail the stone blade manufacturing process of the Alyawara aboriginals (Binford & O'Connell, 1984, pp. 425–427). Binford noted that his observations are consistent with Spencer and Gillen's previous observations taken in the Central Desert between the Warramunga aboriginals (Spencer & Gillen, 1912, p. 374). Based on these, the cores from which the "leilira" blades were struck, had the form of a large keel or a "nosed" block of raw material, that is they were non-Levallois-shaped cores. Other ethnographic accounts also state that aboriginal blade production focused on striking pointed blades directly from the core (e.g., Roth, 1904, p. 17; Spencer & Gillen, 1904, pp. 641–643). In connection with the Levallois technique, Binford referred to and criticized previous publications of Dortch and Bordes (Bordes, 1967, 1980; Dortch & Bordes, 1977). In his view, the identification of the Levallois technique was not based on the formal properties of the cores. In contrast, "leilira" blades were identified as Levallois points and then inferred a type of Levallois preparation during the blade production. Levallois technique should not be inferred from the typological characteristics of an assemblage because artefacts meeting the typological criteria of Levallois products (Levallois flakes and Levallois points) could be produced through non-Levallois techniques (Boëda, 1995, pp. 43–45).

Mark W. Moore (2003b), attempted to compare the archaeological reconstruction of blade production methods on the Georgina River (Camooweal, Queensland), to ethnological accounts across northern Australia. Archaeological analysis of the lithic material recovered from the study area revealed two reduction trajectories. The first trajectory, the Camooweal "Standard" Method for producing pointed blades dominates the archaeological assemblages. Based on the detailed description and the cited ethnographic records, this method corresponds to the experimental reconstruction of Akerman reviewed above. The second common trajectory, the Camooweal "Shark's Tooth" Method, named for the distinctive shape of the target blade, involved the serial production of small, non-pointed blades. Concerning the geographical distribution of blade-making, Moore stated that the Camooweal method appears to be similar to the Levallois-like "prismatic blade" technology identified at the Ord River Valley in east Kimberley (Western Australia) (Dortch, 1972; Dortch & Bordes, 1977). At the same time, Moore mentioned the fact that although Camooweal and the Ord River Valley in east Kimberley are located some 1,000 km apart, the Levallois trajectory has not been described in the intervening region. For the time being, this fact is unexplainable and according to Moore, this may have resulted from a lack of technological analysis rather than the real absence of the technology.

As regards the presence of the Levallois technique in lithic production in Australia, it is necessary to refer to the publication of Grant. W. G Cochrane (2014). Cochrane analysed a surface-collected lithic assemblage of a total of 5,095 artefacts from the Arcadia Valley (South Central Queensland). The assemblage contained 401 cores, among them very distinctive Levallois and discoidal cores. The debitage reflected a substantial amount of centripetal flaking, which is an unusual characteristic in Australian stone tool assemblages. The Levallois cores display great variability; both the preferential and recurrent

Levallois techniques are present. In the assemblage, the artefacts classified as likely Levallois products contained type 1 and 2 Levallois flakes (distal and lateral removals), recurrent Levallois flakes, Levallois points, shark's tooth flakes and *éclats débordants* but no blades. Although faceted platforms are common in most Levallois assemblage, in the Arcadia Valley only 15.9% of the flakes exhibited a clear faceted platform. The low frequency of platform faceting can be interpreted as an example of the technological variation within the framework of Boëda's volumetric concept of Levallois technology. According to Cochrane, "*reasonable to hypothesise that the formal reduction methods that are most prevalent in the Arcadia Valley core reduction sequence model, the Levallois and discoidal methods, are an unrecognised defining feature of the Recent Industry that replaced the Small Tool Industry about 2000 years ago*". Cochrane (2014, p. 17).

In Central Queensland Highlands, the stone artefacts recovered from rock shelter sites were usually made from basalt (Webb *et al.,* 2013). One of the possible reasons Levallois and discoidal methods were applied in the Arcadia Valley could have been that these methods are well-suited to lithic raw material in cobble form. In the analysed assemblage, the overwhelming majority of the flaked stone artefacts were manufactured from silcrete (see, for example, Taylor & Eggleton, 2017) cobbles with smooth water-worn cortex.

6. Conclusion

Taking the above facts into account, we have good reason to assume that the two stone blades in the author's possession are of true Australian origin. This fact is not altered by the uncertainty about the archaeological site and the raw material. The similarity in the technology of making the blades is much more significant than this. However, in particular, the irregular shape of the blade Fig. 1: 2 (B2) and the presence of cortex at the distal end of both blades make it probable that these are not "target blades" but by-products of the blade-making process. Both Akerman (1976a, p. 121) and Moore (2003b, p. 46) emphasized the importance of "termination control" that the angularity of the arris (ridge) created by the removal of the primary blades, particularly when the intended target blade should be pointed with centred arris, is critical for successful blade production. Ethnographic evidence and even the experiments of Akerman suggest that the success rate may have been very low.

Unsuccessful blades were not suitable as spear points but could be used as domestic tools such as knives or scrapers. However, there was likely a large number of such failed blades in the area of some lithic workshops. Although we have no data on the activities of Dutch missionaries in Western Australia, it can be assumed that an ethnographic and/or archaeological collection was also carried out. The blades described above may have come into the possession of the missionaries, courtesy of the natives. The further fate of the blades, how they ended up at the Mineral Exhibition in Hamburg, can only be assumed, but not reproduced with certainty.

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