

Chapter 6

Two Examples of Pressure Blade Production with a Lever: Recent Research from the Southern Caucasus (Armenia) and Northern Mesopotamia (Syria, Iraq)

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6.1 Introduction

Techniques of blade production by pressure, especially with the aid of levers, are subjects of great potential in archaeology since they represent a highly effective and refined means of producing blades. These techniques are, however, optional (as one could do without them and they are therefore not ubiquitous) in contrast with direct percussion techniques which are simpler to perform and very widely practised.

Blade production through application of pressure implies a specific knowledge regarding the use of special tools and knapping methods and a high degree of know-how, especially in the preparatory shaping of cores. As an elaborate evolution of tool-making techniques, pressure-related blade production can be usefully regarded as a marker of particular cultural traditions and of the diffusion of technical innovation (Inizan 1991).

Accordingly, it is important to identify these techniques in each archaeological tradition or period where they were practised and to determine if they were locally invented, acquired by imitation or transferred by craftsmen. In doing so, archaeologists studying blade technology can contribute to the building of a phylogeny or cultural genealogy of the specialized tool-making techniques, a project which is still at its beginning. Although this goal is beyond the scope of the present study, these particular production techniques permit archaeologists to demonstrate the

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presence of specialized craftsmen (Pelegrin 1988) and craft specialization, essential for socio-economic studies in prehistory.

In this chapter, we detail the results of two recent studies from the Near East and the Southern Caucasus that identified the production of blades by a pressure technique with the help of a lever.

The first part of our chapter concerns the Southern Caucasus during the sixth millennium B.C., a time where we view the origins of a Neolithic economy, socio-economic practices that probably came from Northern Mesopotamia. This is an obsidian-rich region, but one that is poorly known archaeologically, and our identification of a pressure technique with a lever represents new information alongside the recognition of contemporaneous use of indirect percussion and an ordinary standing pressure technique.

The second part of our chapter deals with so-called Canaanite flint blades from Northern Mesopotamia at the turn of the fourth to third millennium B.C. These distinctive, large blades are long known, but as they are known to have been produced in different types of flint, and throughout various regions, for about one and a half millennia, it cannot be assumed that they were all made using the same techniques. From the study presented here, two variants of a pressure technique with a lever and a copper point are identified, together with other blades detached by indirect percussion.

6.2 Obsidian Blades from the Late Neolithic Southern Caucasus (5900–5300 cal. B.C.)

From 1999 to 2004, different archaeological investigations were conducted on and around the site of Aratashen in the Ararat plain by an international team under the direction of Christine Chataigner from the ‘Maison de l’Orient Méditerranéen’ (Mission Caucase/Université de Lyon 2), including French, Armenian and Canadian specialists.

The site of Aratashen lies 25 km from Yerevan, the capital of Armenia, and 5 km southwest of Vagharshapat (Echmiadzin). It is situated near a bend of the Kasakh river a few kilometres ahead of its confluence with the Araxe river (Fig. 6.1). The site’s stratigraphy includes two Neolithic layers (between 5900 and 5300 B.C.) and one Chalcolithic layer (4800–4500 B.C.), which are typical of the cultural phases of the Ararat plain region (Fig. 6.2). The site was excavated by R. Badalyan (University of Erevan) and P. Lombard (Université de Lyon 2), with J. Chabot being in charge of the lithic material.

The study of the lithic material, including more than 20,000 obsidian artefacts, demonstrated that agricultural tools made from large blades comprised a significant part of the assemblage in keeping with what one views in other regions of the Near East. From 2005, new excavations were initiated on the neighbouring site of Aknashen, providing a similar lithic assemblage. Preliminary chemical analysis of the obsidian artefacts demonstrated that they were made of raw material from eight different regional volcanic sources (Fig. 6.1).

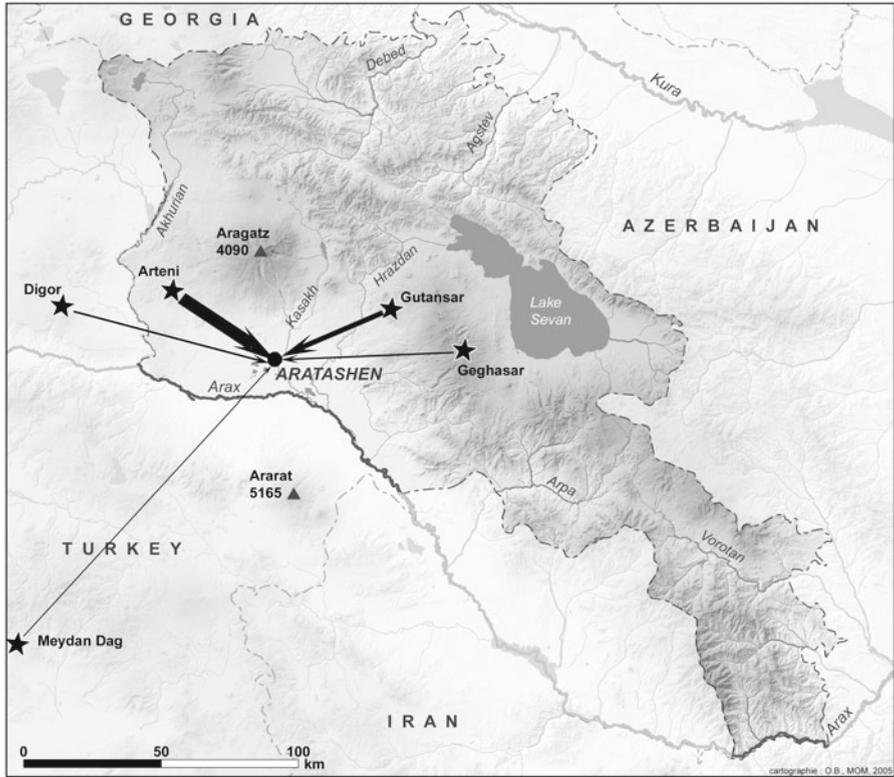


Fig. 6.1 Map of Southern Armenia showing the location of Aratashen and the many sources of obsidian exploited at the site

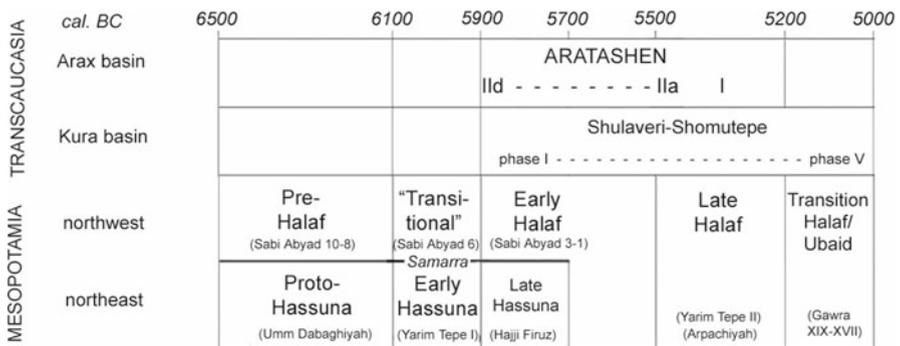


Fig. 6.2 Location of Aratashen within the regional chrono-cultural scheme

Our aim in the first part of this chapter is to describe and identify the techniques used for the production of these obsidian blades, the first such study in an armenian context.

Three techniques have been identified at Aratashen for the *débitage* of long blades: pressure with a crutch (standing position represented by 64 well-preserved diagnostic specimens), pressure with a lever (24 clear specimens) and indirect percussion (29 specimens). All the diagnostic blades came from well-preserved Neolithic levels. Here we provide a description of each of these techniques as reconstructed from the diagnostic blades (for terminology, see Inizan et al. 1999).

6.2.1 Pressure Technique with a Crutch (in a Standing Position)

Clear evidence of this technique is provided by several almost complete blades, and a few cores, left in a good state after the last series of blade detachments (Fig. 6.3). As Crabtree (1968) and Tixier (1984) stated respectively about obsidian and flint, the ‘triad’ of arguments: regularity, (almost) straight profile and thinness (or lightness) all together constitute a strong argument for the identification of a pressure technique. With obsidian, a mechanical argument can even be added regarding the fragility of this glassy material. It would be impossible to detach such regular, thin and almost straight columns of glass by a percussion technique. Only a very regular and prolonged time compression can do it. The few blades shown (Fig. 6.3) are no exception because there are several cores with scars that indicate similar blades had been produced repeatedly.

The core shown in Fig. 6.3 was probably abandoned because it was considered to be exhausted. This indicates that the minimal length of the expected blades was about 12 cm. Because of its pointed tip, the next series of blades would almost certainly overpass and rapidly shorten the core. Scars from larger removals are preserved on one side of the core, which indicate a shaping of the pre-core with axial removals, using direct stone percussion or indirect percussion from a large, flat platform opened by a large flake. Another core (Fig. 6.4) is even longer, with an obtuse base allowing for the detachment of pressure blades up to 17 cm long. This long, barrel-shaped core is certainly not exhausted, although it bears some irregularities at the back of the last productive side (see profile Fig. 6.4). By its shape, it resembles some Mesoamerican obsidian cores (Hirth 2003; Hester 1978) and similarly involves the same question: how could such a long pre-core be shaped? Here we see a few opposite and oblique scars from the obtuse tip, which could complete a possible axial shaping with heavy percussion blades (see *infra*). The width of these pressure blades and of the last blade scars on the cores seems to be about 15–20 mm (Fig. 6.4), data that fits quite well with Pelegrin’s mode 4 of pressure blade production (see Pelegrin, Chap. 18, this volume), that is using a long crutch in a standing position.

The platform preparation consists of removing the overhang left by previous detachment by scratching with a fine-grained stone so that the remnant platform or

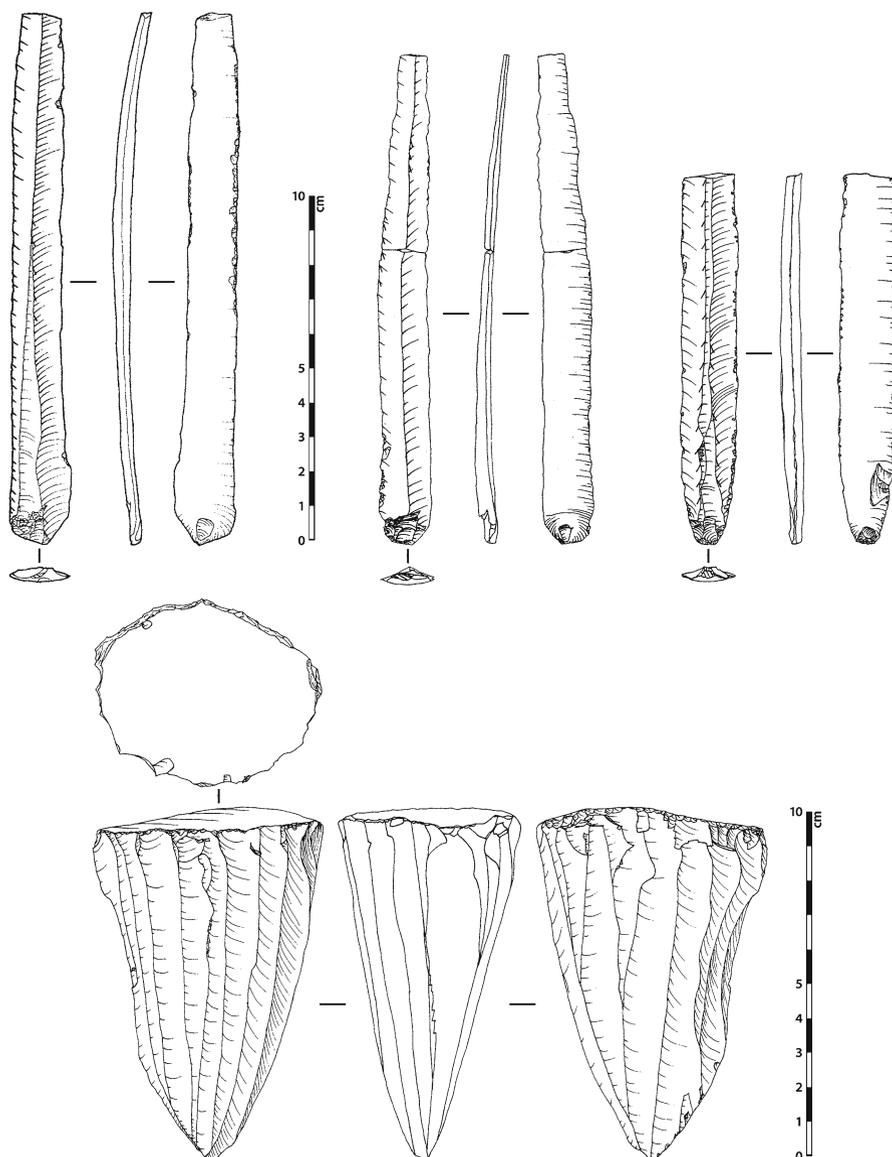


Fig. 6.3 Three slender blades – a possible reason for their discard – and a corresponding conical blade core bearing evidence of having been reduced by a sitting or standing pressure technique

butt of the blades is rather small, with an edge angle ca. 80° – 90° . A small lip is visible at the back of the best preserved butts, and no concentrated impact mark. This is indicative of the use of an organic material, presumably antler for the pressure point.

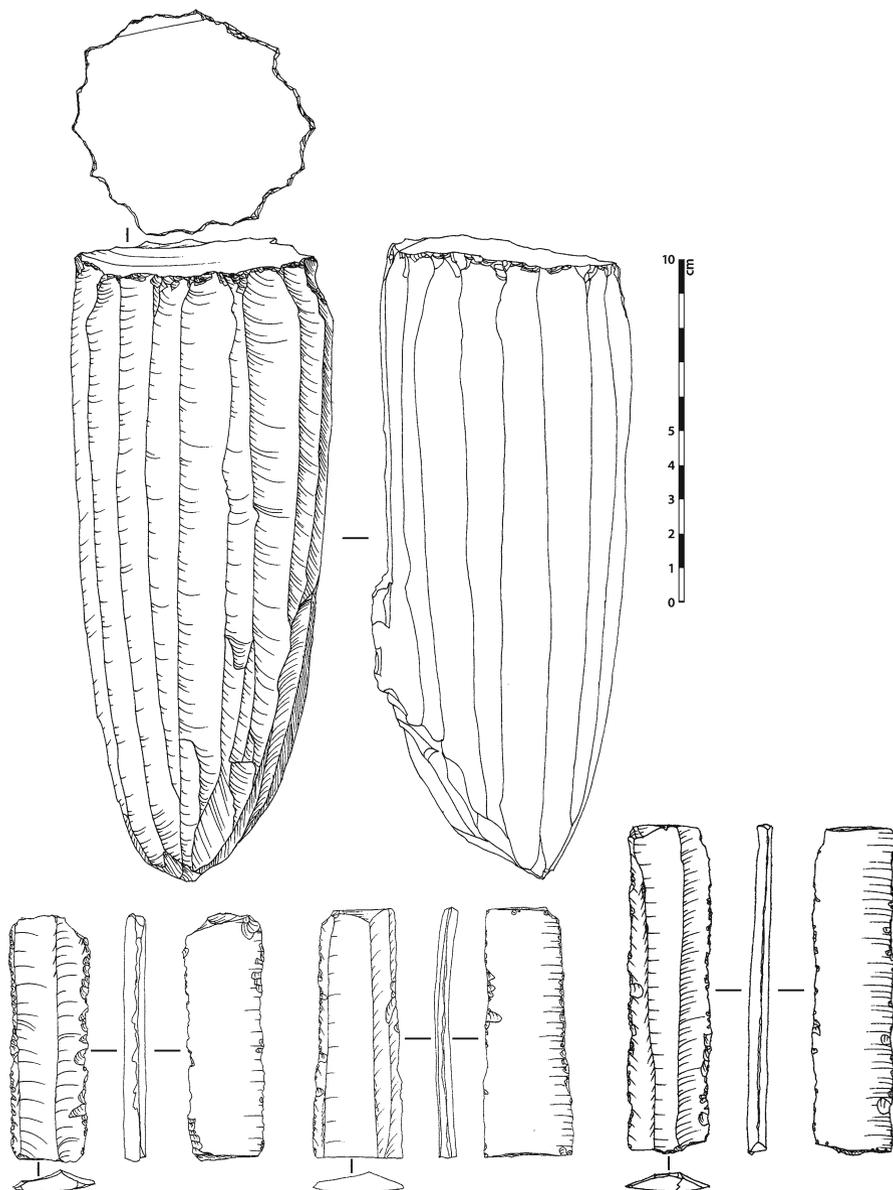


Fig. 6.4 A long barrel shape core and three corresponding blade fragments. The width of the blade fragments and that of the blade scars on the core indicate a standing pressure technique. But the core, considering its diameter, was possibly reduced earlier by lever pressure

6.2.2 *Pressure Technique with a Lever*

Alongside these medium width blades are blades which are significantly wider (well over 30 mm) and much longer, yet are also quite regular and thin (Fig. 6.5). They are without doubt detached by pressure, but the width of these blades cannot be achieved by the standing pressure technique described previously. As Crabtree stated, referring to his great experience with pressure obsidian blade production, the maximum size of the obsidian blades he could produce using his standing technique was 'one inch wide and 8 in. long', that is about 25 mm wide and 20 cm long (Crabtree 1968: 468, see also Sheets 1978 about archaeological prismatic blades with a maximum width of 2.6 cm and thickness of 0.4). Using a different standing technique, Pelegrin was able to manufacture blades up to 27 mm wide and 28 cm long from a crested core with a plain platform (neither pecked and ground nor sawn), but except for an extraordinarily heavy craftsman, it seems difficult to exceed a blade width of 3 cm when working with a plain platform and using the standing pressure technique.

The conclusion is that the wide and regular obsidian blades excavated at Aratashen were detached by a technique that involved some reinforced pressure, that is with a lever (see Pelegrin, Chap. 18, this volume for experimental reproduction). The nature of the pressure tool tip, however, cannot be ascertained.

Armenia, which is so rich in obsidian, was a consistent source of large and regular obsidian blades produced as early as the sixth millennium and possibly earlier, depending on expected discoveries from new sites under excavation, or via the technical analysis of existing collections. Altınbilek et al. (this volume) report pressure blades produced in Anatolia as early as the eighth millennium (probably using obsidian from Nemrut Dag and/or Bingöl, that is about 250 km southwest of the Armenian sites under discussion).

From the blades detached by lever pressure, it is possible to define the main characteristics of the cores they came from, with a plain flat or flat-faceted platform forming an orthogonal (about 90°) edge angle, which leads us to imagine a core shape similar to that prepared for the production of medium length and width pressure blades. It is therefore possible to imagine that some of the cores may have been initially shaped and/or reduced by lever pressure until they could be further exploited by standing pressure, which could be the case for the core from Fig. 6.4.

At the moment, it is difficult to elucidate the specific raw blank type chosen (prismatic/tabular or nodular shape) and the subsequent means by which these large cores were pre-shaped. The dimensions of the blade fragments indicate an average shape of 10–15 cm for the width of the core at the platform and up to a length of 25 cm or possibly even 30 cm. As for the very large 25–30 cm Mesoamerican pressure cores from the 'preclassic' period initially presented by Hester (1978), two possibilities can be evoked. If the raw material consists of regular prismatic fragments, it might be possible to correct the pre-core with limited shaping and to start directly on the corner(s) with the detachment of very large cortical and semi-cortical blades by lever pressure. If not, the whole volume has to be shaped by percussion removals, which is certainly not possible with axial flaking only, once a large platform has been opened, but has to be done by transversal flaking, that is by the way of several crests.

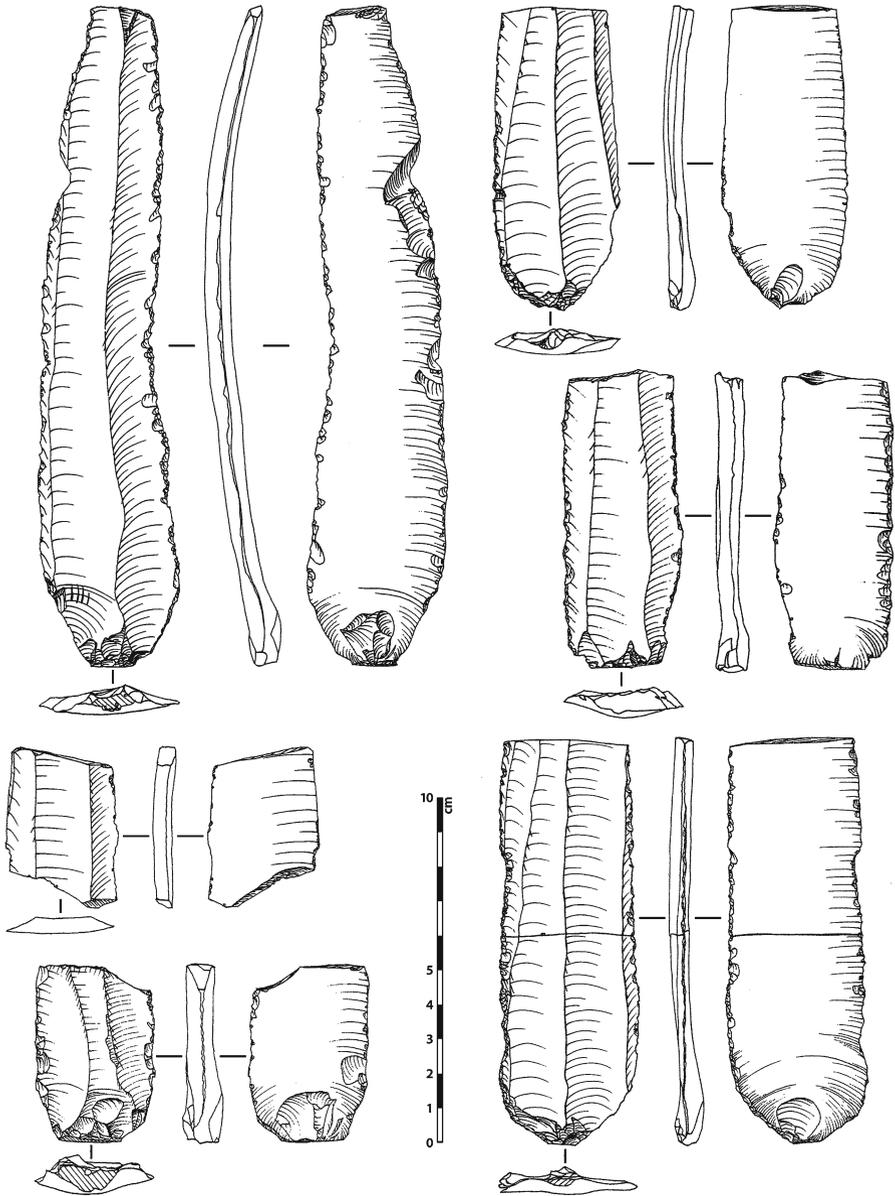


Fig. 6.5 One near-complete blade and five blade fragments, their regularity and width (32–38 mm) indicate a lever pressure technique. On three of the plain orthogonal butts a crack is visible which indicates the use of a copper tipped pressure tool

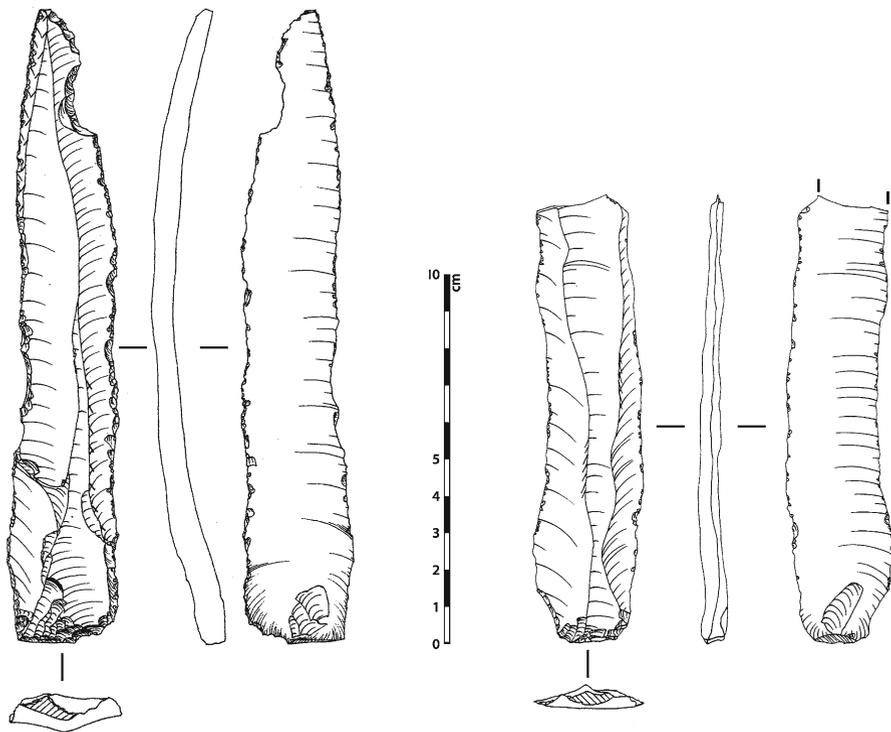


Fig. 6.6 Two blades probably detached by indirect percussion looking at the mediocre regularity of the profile and dorsal ridges

6.2.3 *Indirect Percussion*

Blades of a respectable size, but lacking some of the pressure features, were also recovered from the excavations at Aratashen. Two examples are presented here for description and diagnosis (Fig. 6.6). They are less than regular, with undulating scars (dorsal arises) and a wavy ventral side. Their butt is quite thick (clearly thicker than pressure blades which usually have a more careful overhang reduction) and again flat and orthogonal that is detached from a large plain platform. We do not believe that such blades can be detached in a series considering their previous dorsal scars by direct stone percussion, neither by organic nor by soft stone percussion (which would deserve an acute platform angle and a more refined edge rounding). These two blades in particular, on the left side of Fig. 6.6, are much more typical of indirect percussion. They could originate from a workshop where the pressure technique would not be known or used, which is doubtful, or they could probably be some end-selected by-products from the shaping of medium size pressure cores. It has indeed been shown, as a technical possibility, that medium size conical cores can be shaped by indirect percussion (Pelegrin 2003); however, more evidence of this ‘punch technique’ would be welcome to prove this hypothesis.

A lot of information is still missing in order for us to reconstruct a general view of the chrono-cultural sequence related to the blade production of the Armenian Late Neolithic. We are also hindered by the fact that so little is known of the Neolithic in the Southern Caucasus and that we know practically nothing of the detachment techniques known from the same period (or earlier) in regions to the north and to the east.

We do at least know that the culture represented in the Araxe basin by the sites of Aratashen and Aknashen-Khatunarkh shows very close links with the Shulaveri-Shomutepe culture, which developed throughout the sixth millennium to the North in the Kura basin. Architecture, as well as ceramics, bone and lithic industries, testifies to the fact that these two cultures share a common root, and it could be amongst this common stock that the technique of pressure with a lever developed (Arimura et al. 2010).

However, it is currently considered that the introduction of domestication into the Southern Caucasus (in particular the culture of the hexaploid naked wheat, which was largely widespread in both the Araxe and Kura basins in the sixth millennium) could in fact have been brought into the region by populations coming from Northern Mesopotamia (Zohary and Hopf 2004). This could constitute an interesting route to explain the transfer to the Caucasus of the lever pressure technology, the technique possibly coming from Eastern Anatolia, where it is attested during the second half of the eighth millennium and into the seventh millennium as well (Altınbilek et al., Chap. 5, this volume).

The production of similar large blades seems to continue in Armenia into the Chalcolithic period during the fifth millennium and the first half of the fourth millennium (Badalyan et al. 2009). It is noteworthy that the Araxe basin is located only 250 km from the southeast bank of the Black Sea and the Kura basin is only 100 km away. It is then possible that this tradition might be the source of some of the Eneolithic technological traditions of North-Eastern Bulgaria, where pressure with a lever technique on flat pressure platforms appears as early as 4900 B.C. (Manolakakis 1996, 2005).

6.3 Canaanean Blades from Early Third Millennium Northern Mesopotamia (Northeast Syria, North Iraq, Southeast Turkey)

The so-called Canaanean flint blades were first distinguished on the basis of their large size and regularity in the Levant by R. Neuville (1930) and were subsequently described by J. Cauvin at Byblos, Lebanon, where they were imported from the Early Eneolithic before increasing in size in the Early Bronze Age.

More recently, similar flint blades have been described in Northern Mesopotamia by I. Caneva (1993), C. Edens (2000), J. Chabot (2002), J. Chabot and P. Eid (2003), Y. Nishiaki (2003) and A. van Gijn (2003) (Fig. 6.7).

These large and regular blades are usually found as 5–7 cm long fragments with one or two glossy edges and sometimes bitumen residue from hafting, following

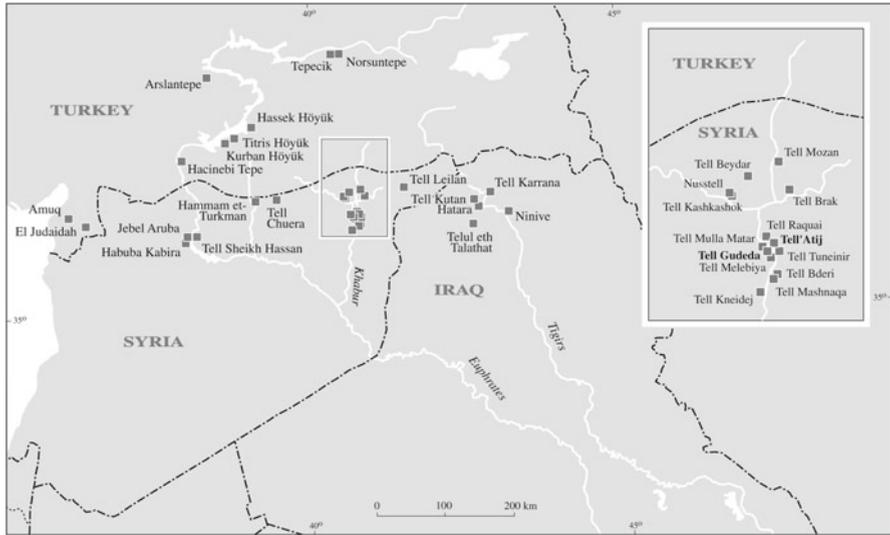


Fig. 6.7 Sites in Northern Mesopotamia where Canaanite blades have been identified

their use as sickles or threshing sledge elements (Collin 1992; Anderson and Inizan 1994; Anderson et al. 2004; Chabot 2002). From here on, we will call such fragments ‘Canaanite elements’.

There is evidence for the production of such long blades amongst a few south-eastern Anatolian settlements of the Upper Euphrates, including Hassek Höyük (Behm-Blancke 1992), Hacinebi (Edens 2000; Stein 2000) and Titrıs Höyük (Hartenberger et al. 1999; Matney et al. 1999). Other areas of production are now known in Israel and Palestine, albeit with some differences in the butts of these blades that probably relate to local traditions of platform preparation (Shimelmitz 2009).

In general, these Canaanite blades have an exceedingly wide geographic distribution, having been recovered from sites throughout Northern Mesopotamia and the Levant down to the northern Negev. Temporally, their production extends from about 4000 to 2500 cal.B.C. in the North (from Late Chalcolithic to Uruk and Nineveh V – Early Bronze II) and 3600 to 1950 cal.B.C. in the South (from the Early Bronze to Middle Bronze I; Rosen 1997), though a recent reference suggests a somewhat earlier appearance before the Early Bronze Age (Bar and Winter 2010).

6.3.1 *Lever Pressure Technique with a Copper Point*

Judging from the different collections that we could examine, a significant number of these large Canaanite blades seem to have been detached by pressure, which, given their width (usually over 2.5 cm), had to have involved the use of a lever (see Pelegrin, Chap. 18, this volume).

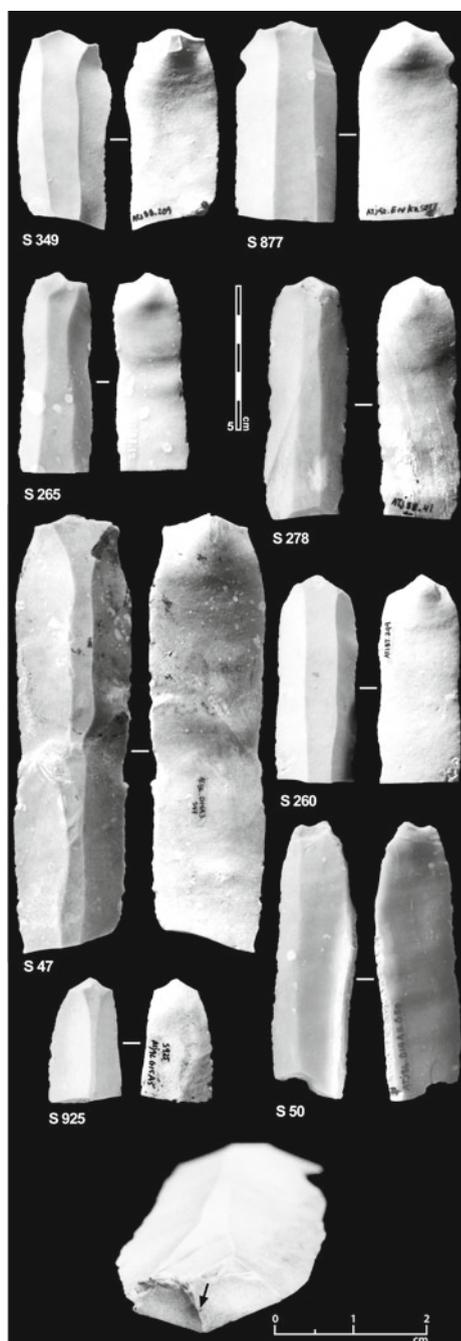
With the proximal fragments of wide and regular blades having a dihedral butt that slopes forward (forming an obtuse platform and flaking surface angle), it is further possible to argue that the lever pressure tool had a copper point. The use of a copper tip can frequently, but not always, result in the production of a discrete transversal crack or micro-crushing on the ridge of the butt (see below, and Fig. 6.8b). A decade of experimental work by one of us (J.P.) from 1986 to 1995 (mainly at the Lejre Research Centre) has demonstrated that both indirect percussion and lever pressure using organic materials fail to detach blades with an obtuse dihedral butt because the tool slips forward, whereas copper as a soft, plastic metal offers sufficient 'grip' on a grainy enough flint. However, lever pressure with an organic point can work well on a dihedral *non-obtuse* platform, while indirect percussion on such a platform preparation provides no advantage (cf. Pelegrin, forthcoming article). Unfortunately convex, or flat-faceted, or plain blade butts that form an average orthogonal angle are much less technologically diagnostic; they can relate to both indirect percussion and lever pressure, unless they display a distinctive crack on the butt (see below).

Fortunately, the recent excavations by M. Fortin at Tell 'Atij and Tell Gudeda (North Syria, Early Bronze Age/Nineveh V) have generated several hundred Canaanean elements, including long and/or well-preserved proximal fragments, many of them with the aforementioned crack in their butts (Fig. 6.8). The recurrent combination of regular form and almost straight profile, plus a wide but not so thick section (the critical associations for the recognition of pressure blades [cf. Tixier 1984]), together with dihedral butts (some obtuse [Fig. 6.8]), demonstrates that many of the Canaanean elements from Tell 'Atij and Tell Gudeda were detached by lever pressure using a copper point which was used for the detachment of many of the Canaanean elements from Tell 'Atij and Tell Gudeda (Chabot 2002; Pelegrin 2006). Incidentally, further evidence for the use of a copper-tipped punch could be observed on some crested blades bearing very small and clear circular cracks, obviously produced by a very pointed tool that is necessarily metallic.

Another technologically indicative feature on one of the Tell Gudeda blade fragments is a specific form of edge damage (called 'counterflaking' by Healan and Kerley 1984 [also 'spontaneous retouch' by Mark Newcomer]) that results from the edge of the blade being detached by coming into contact with a hard or firm material, likely the device that had been used to immobilize the core (Pelegrin 2006: 52–53). This data provides additional evidence for the use of a pressure technique (specifically a lever, given the blade width), as the immobilization of the core for blade detachment is something that one does not associate with percussion techniques. Finally, our experiments have proven that lever pressure can produce some ripples on the bulb, or shortly thereafter (due to micro-movements of the core in its immobilizing device during compression and early detachment). Such ripple marks are visible on some of the archaeological blades or on some of their previous blade scars on the upper side.

It is worth noting that a substantial fraction of similar 'Canaanean' elements from Tell 'Atij and Tell Gudeda are fragments of blades that had been detached by indirect percussion (or 'punch' technique). This is clearly the case with some of the proximal

Fig. 6.8 Seven proximal Canaanean elements from Tell 'Atij, with dihedral butt and frequent ripple marks under the bulb



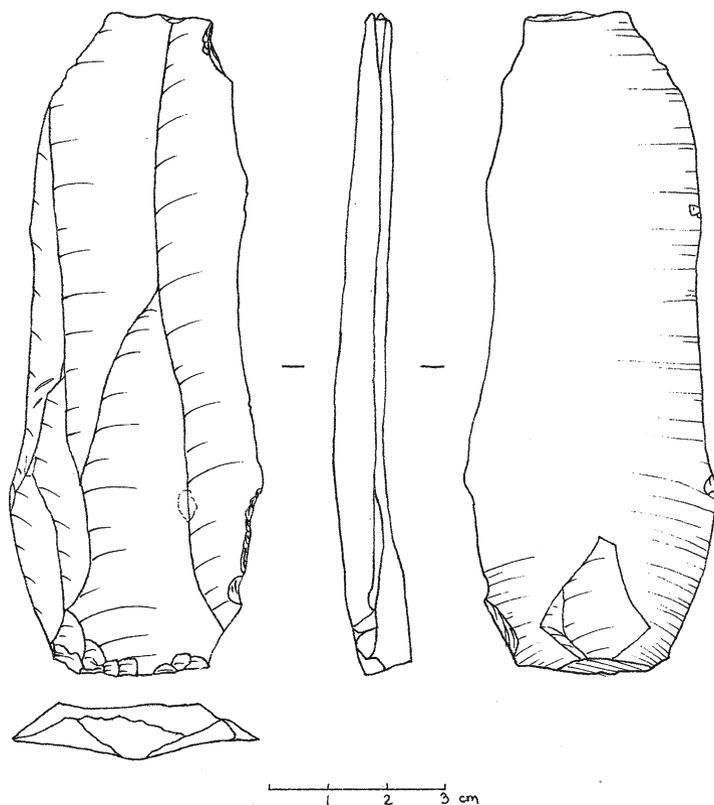


Fig. 6.9 A 'Canaanese element' from Tell 'Atij made from a wide and short shaping blade with a thick orthogonal plain butt: detached by indirect percussion

fragments that show a plain orthogonal thick butt without a crack, indicating the use of an antler punch (Fig. 6.9), and it is also suggested by some medial or distal elements that are irregular in form. Some of these could be 'secondary products' struck from the same core during the core shaping sequence (a few with residual cortex) or from its further reduction following the main production sequence by lever pressure. But one cannot rule out that some of these 'punch-detached' blades came from specific cores or even workshops that were primarily, if not exclusively, employing percussion techniques (this might particularly be the case if the raw material available is smaller in size).

From a similar context, one of us (J.P.) examined two regular proximal Canaanese elements from a group of about 20 pieces (4–7 cm long, most of them between 3 and 4 cm wide) from the site of Kután in Northern Iraq (Nineveh V context, excavated by L. Bachelot), a collection that has been previously studied and published by Anderson and Inizan (1994, Fig. 3, pp. 91; here Fig. 6.10). Fortunately, the butts of these two pieces are well preserved (these Canaanese elements were often simply broken without preliminary retouch or truncation, and not further reused); here the platform preparation is somewhat different from that of Tell 'Atij and Tell Gudeda,

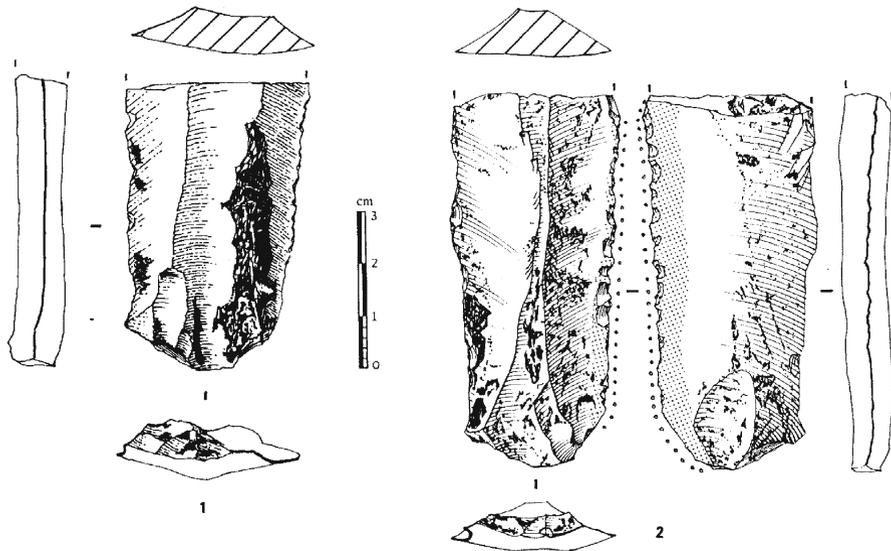


Fig. 6.10 Two proximal fragments from Kutan (K 258-23/10, K 249-9) (Courtesy of Anderson and Inizan 1994. Drawings: M. Reduron)

consisting mainly of faceting (except for a small removal towards the flaking surface for both of the pieces, in order to facilitate the platform faceting). Each butt thus looks convex faceted, forming an orthogonal edge angle, but the pressure occurred on an obtuse ridge in the middle of the butt surface (note that this ridge is much less prominent than that of the Tell 'Atij proximal blade fragments). The diagnostic character is that a minute crack is visible, forming a half circle or a '∧' over the ridge only 2 mm in front of the back edge of the butt (Fig. 6.10). This indicates a limited contact over a few square millimetres, meaning the use of a hard and pointed material. This is subtle, but significant, evidence for the use of a copper point, because any organic material would spread on the platform and determine a much larger area of contact (and would not usually produce a crack, according to our experiments). In this case, with regard to wide flint blades, such a crack is indicative of a small contact area and is thus by itself an argument for a pressure technique because experiments proved that using a copper-tipped punch to detach large heavy blades by indirect percussion seems less efficient than using an antler punch.

We also note that, depending on the regions and possibly the periods, different varieties of flint are represented amongst these Canaanite blades and elements (as was originally reported in the Levant by Cauvin [1968]). This might signify the existence of different workshops or production areas, amongst which might have developed subtly (or overtly) different technical traditions. Presently, it seems that most of the Canaanite elements from Tell 'Atij and Tell Gudeda were made from a rather fine-grain flint, from light yellow to yellowish or pinkish grey in colour, which could possibly correspond to some of the varieties from the Upper Euphrates (200 km to the northeast) as worked in Hasek-Höyük (see colour photos in Behm-Blancke 1992), while those from Kutan and other Tigris valley sites were generally

made from a coarse beige or whitish-grey flint, the origin of which is unknown to our knowledge.

Regarding Hassek-Hüyük, we now regard the claim that the Canaanite blades from the site had been produced by indirect percussion using a copper point as premature (Pelegrin and Otte 1992), the study having been undertaken at a time (1989) when J.P. had little practical experience concerning the detachment techniques for large blades and their technologically diagnostic features. Through a reconsideration of the well-illustrated blades and cores (Behm-Blancke 1992), we now believe that most of the blades were in fact detached by lever pressure. Discussing the material of the pressure point would, however, require a new first-hand examination of the archaeological material.

6.4 Conclusion

These observations, together with others (this volume), represent the building blocks for reconstructing a 'genealogy' of specific lithic technologies in this broad region during the Neolithic and Chalcolithic. We cannot, however, complete a general framework as long as so many pieces of the puzzle remain missing from the whole of the Near-Middle East and neighbouring regions.

At the very least, we can say that the origin of the South Caucasian obsidian pressure blade production techniques may well be found in Eastern Anatolia, amongst communities around the Bingöl and/or Nemrut Dağ volcanoes that lie only about 250 km southwest of the Araxe basin. However, it remains to be determined if the known period of Anatolian pressure with the lever technology, which at present ranges from the second half of the eighth millennium through the second half of the seventh (Altınbilek et al., this volume), continued until the beginning of the sixth millennium, a pre-requisite for this region being a viable candidate for the origin of this technique in the Southern Caucasus.

The phenomenon of the Canaanite blades was dealt with only briefly here. Long-lived and associated with several areas of production, it may take on an increasingly variable nature as more collections become the subject of specialized technological studies, documenting the modes of preparation and techniques of detachment. Currently, it is thought to have developed in Northern Mesopotamia, reaching the Southern Levant some centuries later, but it is premature to discuss with any confidence its origin and transfer/diffusion or indigenous development in other distant regions.

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