Oblique bipolar flaking, the new interpretation of mode-I

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1. Introduction

It is generally assumed that Oldowan flakes were made in the same way as Acheulean flakes. The Oldowan is therefore seen as a 'pre-hand-axe stage' called Mode-I (Fig. 1). But on close inspection the diagnostic signals demonstrate the use of oblique bipolar flaking as primary reduction technique (van der Drift, 2012).

2. Methods

Artefacts were investigated by close inspection and by reproduction in experiments. This confirmed that hand-axe industries used freehand reduction as primary technique; producing diagnostic conchoidal flakes and cores (paragraph 2.1). And showed that non-hand-axe industries used a different strategy based on bipolar reduction; producing non-conchoidal flakes and cores (paragraph 2.2). As illustration hundreds of lithics and a few experiments were filmed and shown on two DVDs (van der Drift, 2007; 2011).

2.1. Diagnostic conchoidal flakes

Freehand flakes show prominent bulbs. Prominent is not the same as thick; prominent means that the bulb falls inside the cone-shaped compression-zone immediately below the point of impact. This makes the bulb stand out against the stretched-zones to the left and the right of the cone. For other diagnostic aspects of conchoidal flaking see van der Drift (2012).

2.2. Non-conchoidal flakes

The fracture patterns are dramatically different when a core is struck whilst it rests on an anvil, this is called bipolar reduction. The 'nut-cracking technique' or

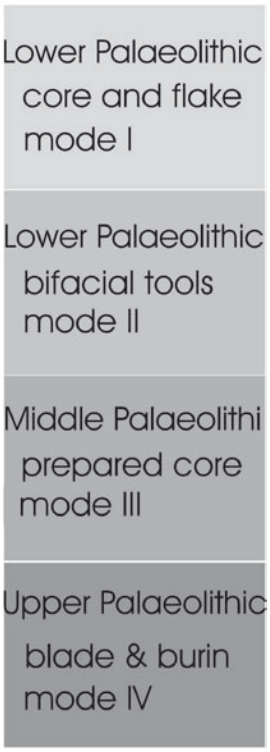

Fig. 1 – The Palaeolithic is partitioned into consecutive development stages.

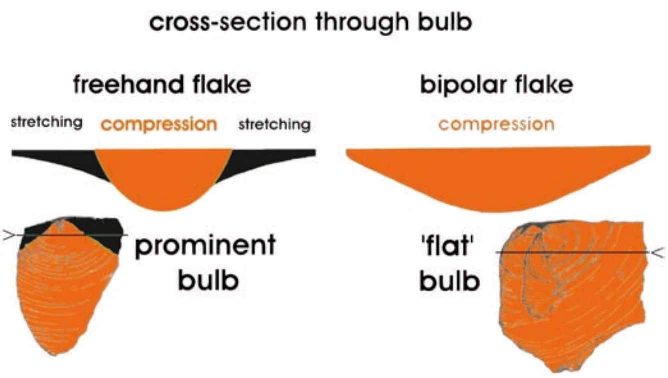

Fig. 2 – In freehand flakes the compression inside the neutral cone contrasts with the stretching-tension zones. Bipolar flakes have no neutral cone therefore the bulb is called diffuse.

straight bipolar reduction is seen as a low prestige technique and was used to open pebbles and cobbles. But the oblique bipolar technique is far more important, it produces flakes resembling freehand flakes. Unlike freehand flakes however, bipolar fractures result completely from compression. There are no stretched zones, therefore the bulbs are diffuse. This is explained in figure 2. Such diffuse bulbs and other non-conchoidal fracture patterns are seen in Oldowan artefacts; we must therefore conclude that Mode-I was based on oblique bipolar reduction.

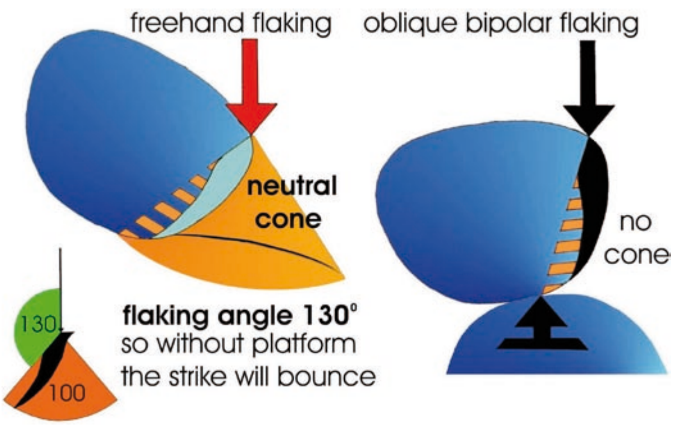

Fig. 3 – Left: this rounded cobble cannot be flaked from the free hand because the platform is not at the correct angle. Right: oblique bipolar flaking is easy and effective.

2.3 Oblique bipolar flaking

The advantage of bipolar flaking becomes clear when you attempt to flake the cobble in figure 3. When you try to flake the cobble from the free hand it must be held tilted, using the flat side as a striking-platform (left drawing). The aim is to make a compression cone that lies largely outside the core. But that results in an angle between striking-platform and strike that is so small, that the hammer will bounce. So only cores with a platform at an acute angle can be flaked from the free hand. It is however very easy to flake this cobble on an anvil (drawing on the right); simply keep the platform horizontal and the strike vertical. As shown in figure 2 there is no cone, instead the forces are directed towards the anvil.

But the strike is not pointing towards the anvil and this diverts the actual fracture line to the right. And just like the freehand flake would divert (from the cone to the right), here the bipolar fracture line also pulls towards the outside of the core because this allows for more deformation. The resulting flake does not include the anvil-contact-point; it resembles a freehand flake; showing one impact point, a bulb, ripples, a scar and a sharp cutting edge. When such flakes are made by using the ground as a soft anvil they can even show diagnostic conchoidal signals. Because the strike does not point straight towards the anvil I named this oblique bipolar flaking. In secondary trimming, the oblique bipolar fractures are often initiated from the anvil-contact-point (van der Drift, 2011; 2012).

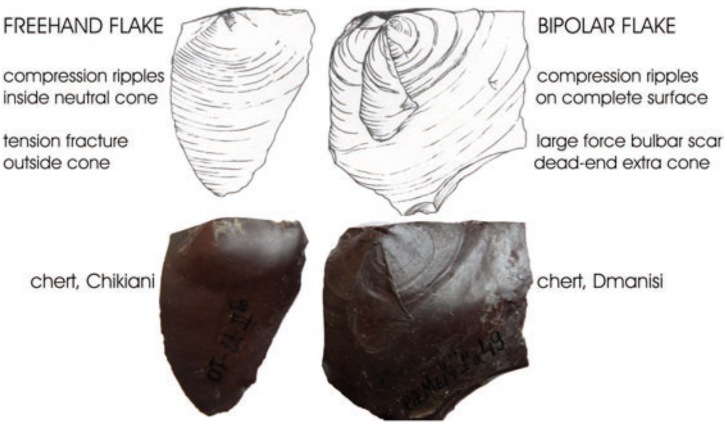

Fig. 4 – Comparing diagnostic signals on a freehand and bipolar flake in chert.

3. Materials and results

Private collections were studied, including finds described by Peeters *et al.* (1989a, 1989b); in the order of 10.000 lithics from hand-axe industries and in the order of 20.000 lithics from non-hand-axe industries were inspected. The hand-axe industries consistently showed diagnostic signs of conchoidal flaking. And the non-hand-axe industries consistently showed the signs of oblique bipolar reduction. The non-hand-axe industries can therefore be called bipolar industries (van der Drift, 2001). The non-conchoidal character of bipolar industries has led to a dispute about the artificial character. To counter this, the undisputed Oldowan artefacts from Dmanisi (Georgian National Museum collection) were included into my study. As expected the fracture patterns in Dmanisi are non-conchoidal, some examples are given here in figures 4 to 7 and in van der Drift (2011).

Figure 4 shows a freehand flake in chert from Chikiani (Acheulean). This is compared to an oblique bi-polar flake in chert from Dmanisi (Oldowan). The freehand flake shows a prominent bulb and the bipolar flake shows a thick diffuse bulb. Because of the large bulbar scar, the steep flaking angle and the simple striking-platform, this flake can be characterised as a Clacton-flake.

Figure 5 shows a large flake in basalt from Dmanisi, resembling a freehand feather. But close inspection reveals a diffuse bulb and a very large central scar. Both the bulb and the scar prove this is an oblique bipolar flake. The lip (in side-view) is reproduced in experiments when the bipolar rupture is initiated from a larger contact-area.

Fig. 5 – Comparing a bipolar flake from Dmanisi and an experiment in basalt (drawings not to scale).

Figure 6 shows a large flake in volcanic tuff from Dmanisi, resembling a flake from a prepared core. The drawing on the left shows a striking platform at the correct angle. And a prominent bulb, projecting from between the tension fracture areas, this bulb merges into a parabolic fracture line. But the photo and the drawing on the right show that these diagnostic signals of conchoidal flaking are completely absent; there is only a simple diffuse curve from hammer to anvil. Secondary trimming from the free hand tends to make smooth edges, but trimming on an anvil often shows a denticulate tendency.

Figure 7 shows a basalt core from Dmanisi. The large cobble was first split using straight bipolar percussion (nut-cracking technique); this produced the flat striking platform we see in

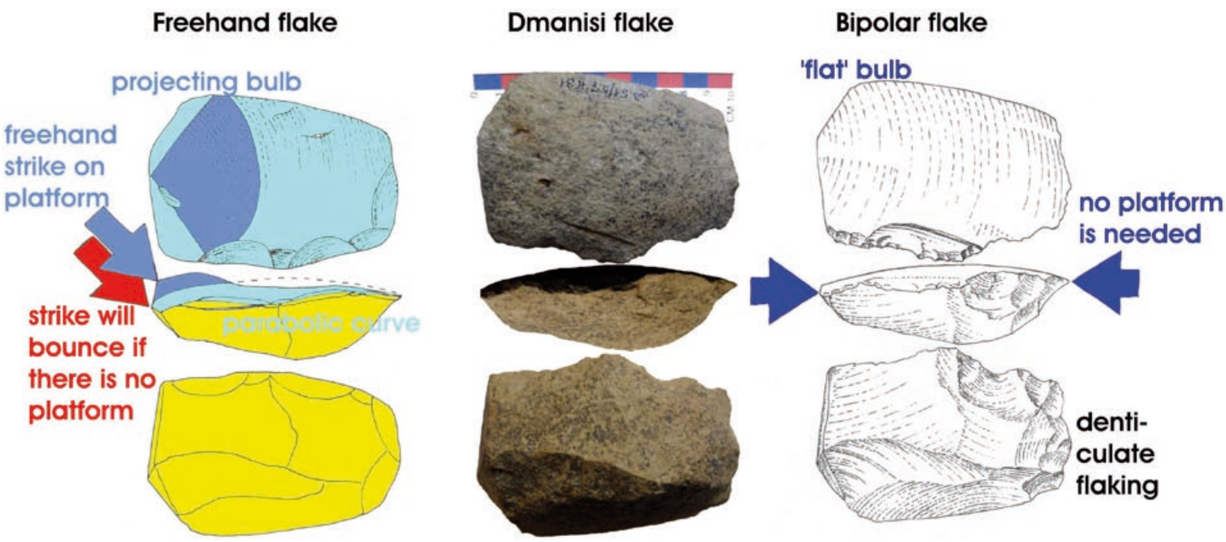

Fig. 6 – Comparing a sketched freehand flake to a bipolar flake from Dmanisi in tuff.

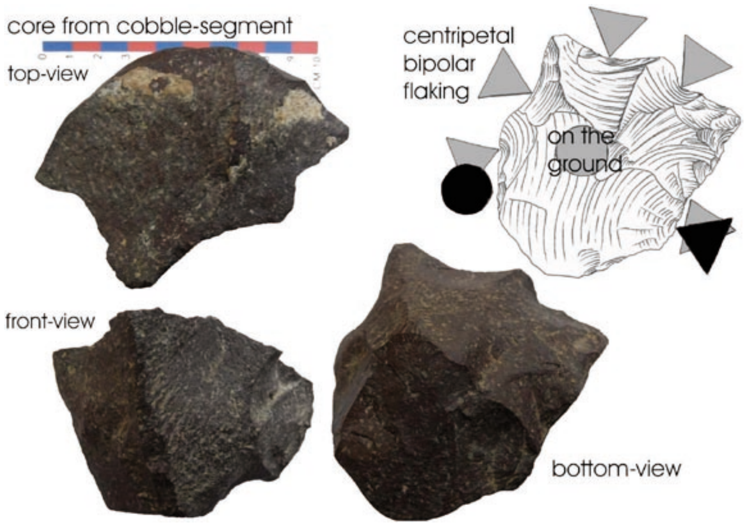

Fig. 7 – Core from Dmanisi in basalt. The floor was used as a soft anvil. Note the deep removals.

the top-view. A second bipolar fracture is seen in the bottom-view; the hammer struck near the black triangle whilst the split-cobble rested on the anvil near the black circle. This flaking negative was then positioned on the soft ground (grey circle) and oblique bipolar flakes were removed by successive centripetal strikes (grey triangles) leaving deep scars.

4. Conclusions

Sites with an undisturbed fine grained matrix and hominid fossils are considered secure sites. Commonly it is believed without further questioning that all flakes from secure sites are freehand artefacts. But close inspection has proven the common determination practice (Fig. 8, algorithm A) wrong. The correct determination procedure is shown in algorithm B; this procedure enables us to recognize bipolar toolkits from both secure and insecure sites.

Bipolar flaking was the basic technique in the Oldowan. This explains why the Oldowan evolved into the Developed-Oldowan, which persisted in Africa next to the Acheulean. We see a similar development in Europe; oblique bipolar reduction persisted next to the Acheulean in the Clactonian, Tayacian and pebbletool industries. These bipolar industries show non-conchoidal fractures, the absence of thin symmetrical hand-axes and the presence of Tayac-points and notched and denticulated tools. Fertile river deltas and climate zones where the vegetation made it impossible to find raw material for hand-axes, could not be colonized by the Acheulean. But bipolar industries thrived in these ecological niches, because they were independent of the raw material quality and shape (Fig. 3). These insights lead to a new partitioning of the Palaeolithic based on two parallel lines, as shown in figure 9.

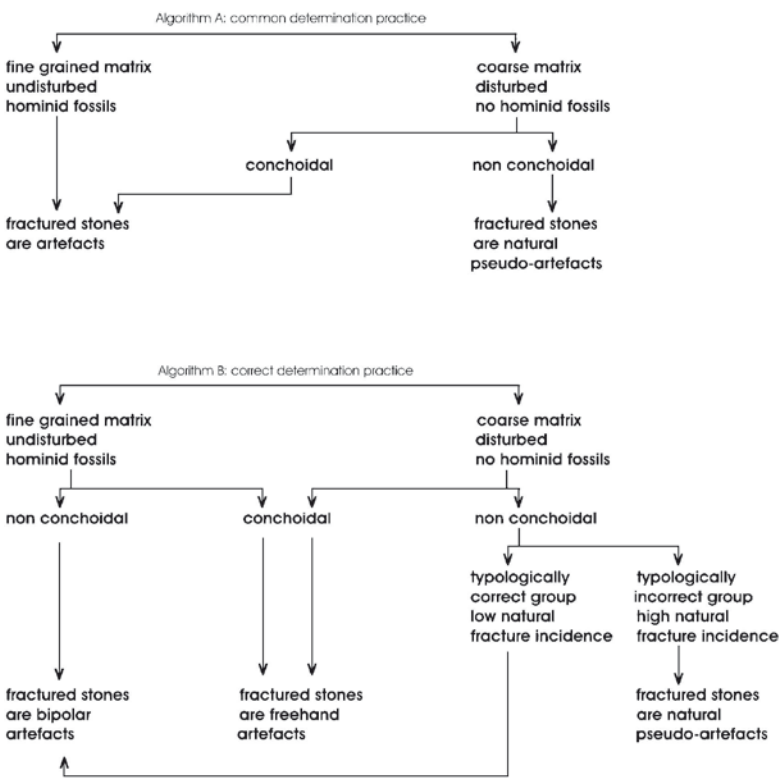

Fig. 8 – Determination algorithms. The common practice in algorithm A is wrong, he correct procedure in algorithm B differentiates between freehand and bipolar industries.

A more elaborate exploration of the technological and typological signals, chronological developments and the contrast between the freehand bifacial mental template versus the bipolar toolkit concept is discussed in: Partitioning the Palaeolithic, introducing the bipolar toolkit concept (van der Drift 2012; Fig. 10).

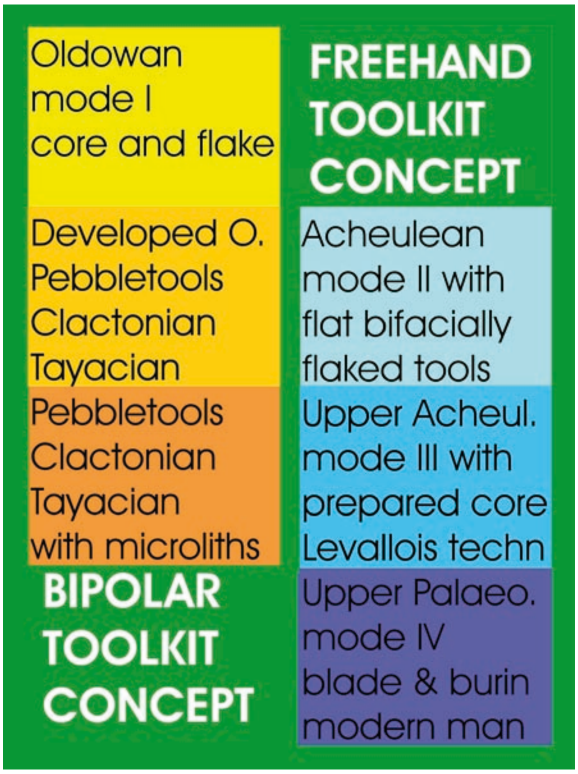

Fig. 9 – Instead of consecutive stages as in figure 1, the Palaeolithic shows two parallel typo-technological development lines. The bipolar toolkit concept line with the Oldowan, Clactonian, Tayacian and pebbletool industries was separate from the freehand (bifacial mental template) line.

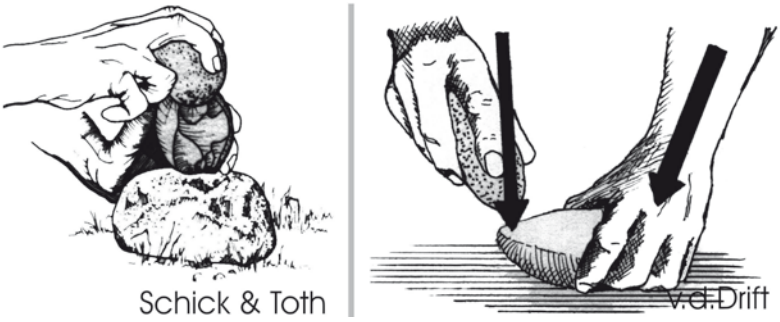

Fig. 10 – The term bipolar technique is often associated with the nut-cracking technique, left. But to make a bipolar flake, the strike was not straight above the anvil. And often the ground was used as a soft anvil, right.

Acknowledgments

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Abstract

Recognizing oblique bipolar flaking gives us a new perspective on the earliest lithic technology and on Palaeolithic development lines. Close inspection shows that Mode-I artefacts were made by oblique bipolar flaking. Determination algorithms, 'cultural' attributions and the partitioning of the Palaeolithic must be changed accordingly.

Keywords: Mode-I, bipolar, diagnostic signals, oblique bipolar flaking, partitioning of the Palaeolithic.

Samenvatting

Het herkennen van schuine bipolaire afslagen geeft ons een nieuw inzicht in de oudste steen technologie en paleolithische ontwikkelingslijnen. Nauwkeurige bestudering toont aan dat Mode-I artefacten werden gemaakt door schuine bipolaire afslag techniek. Determinatie algoritmen, 'culturele' toewijzingen en de indeling van het paleolithicum moeten daaraan worden aangepast.

Trefwoorden: Mode-I, bipolair, diagnostische kenmerken, schuine bipolaire afslag, indeling oude steentijd.

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