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Comparing Bipolar Artefacts with Pseudo-Artefacts and Industrial Waste
An overview based on experimentation

Jan Willem van der Drift

Abstract

In bipolar techniques an object is simultaneously worked with hammer and anvil. This results in forces from opposed sides, hence the term bipolar. Pseudo-artefacts (or geofacts) are often the result of pressure forces from opposed sides. And flint nodules, as a waste product from the cement industry, are fractured by forces from opposed sides. Since opposed forces are the common denominator, many similarities can be expected between these groups. But there are also technical differences between these groups such as the occurrence of percussion marks and deep notches.

Keywords: Bipolar technique, anvil, pseudo-artefacts, eoliths.

1. Introduction

Since 1968 Dutch amateurs have collected many stone assemblages of which the hominid provenance is debated. Some of these have been published by Peeters *et al.* (1988). The supporters of these assemblages have tried to prove the artefact character first of all by comparison of the stones with generally accepted artefacts. For instance from Tautavel, Vértesszöllös and Bilzingsleben. The Dutch finds have furthermore been reproduced in experiments, making a hominid provenance more likely. In 2007 I have made a DVD, *Het bipolaire toolkit concept*, on which some experimental reproductions are shown.

The claimed hominid provenance is often rejected with the argument that the debated assemblages are merely selected natural forms. The selection of desired objects is often referred to as "Sammelsurium". The best known example of such a group created by selection is the historical collection of eoliths from Boncelles, known as "Fagnian". These eoliths were collected by the famous geologist Aimé Rutot in a period when it was yet unclear when the first hominids had evolved. Nowadays fossils and DNA prove that the hominid lineage is far younger than the Oligocene layers from which the "Fagnian" eoliths have been collected. The certainty that the "Fagnian" cannot contain artefacts, makes it the perfect comparison material to test the Sammelsurium theory. This is the assumption that amateur archaeologists can create stone assemblages resembling real artefact groups by selecting desired objects. For this reason I visited the Royal Belgian Institut of Natural Sciences in Brussels on 23-10-2010 to view the historical "Fagnian" collection.

2. General characteristics of bipolar fractures

In 1939 Barnes noted that eoliths and pseudo-artefacts were remarkably different from the Acheulean assemblages. The Acheulean tools were as Barnes put it: "furnished with acute edges for cutting and scraping" and eoliths often showed obtuse angles. This led hem to the conclusion that all assemblages with more than 25 % obtuse flaking angles, cannot be of hominid provenance. This viewpoint has since than become widely accepted and many experiments using only hammers (freehand flaking) have demonstrated that flakes generally show a characteristic platform, bulb and flaking scar. These are often referred to as the diagnostic marks of conchoidal flaking (diagnostic CF marks). The presence of CF marks has become a second criterion for the acceptance of hominid provenance.

Our group has conducted completely different experiments, involving the simultaneous use of hammer and anvils. In all of these experiments it has become clear that the experimental products often have obtuse angles and often do not have diagnostic CF marks. These experiments (van der Drift, 2007) conclusively prove that neither the acute angles nor the CF marks are obligatory for artefacts. The correct approach is that CF marks are truly diagnostic for freehand reduction (flaking using only a hammer). Freehand reduction is the method of choice in Acheulean and younger assemblages. In non-Acheulean assemblages most often bipolar techniques (combined use of hammer and anvil) are the method of choice. Thus non-Acheulean assemblages are not required to have acute flaking angles and CF marks.

Fig. 1 – Experimental bipolar products.
Left: Half pebble in side-view. Note that there is no separate striking plane, that the reduction face is almost flat, there is no actual bulb.
Right: Half pebble. Note that there is a ripple pattern from top to bottom, so called bipolar ripple patterns are very rare in bipolar experiments. As a result the technique is most often not recognised in bipolar industries.
Top: Scraper made with bipolar retouches. Bipolar retouch often leads to denticulate edges. The coin at the bottom measures 22 mm.

We must conclude that bipolar reduction experiments produce the same fracture marks (for an overview of such marks see: van der Drift, 2009) as we see in non-Acheulean assemblages. But we can find exactly the same marks in mechanically reduced flint waste from the cement industry and even in natural flakings (i.e. the "Fagnian"). This should not come as a surprise because the same laws of physics apply to all bipolar fractures irrespective of their cause. Now that it is clear that acute angles and CF marks are not diagnostic for non-Acheulean assemblages it becomes necessary to look for other ways of recognising hominid provenance.

3. *Distinguishing non-Acheulean assemblages from pseudo-artefacts*

The first thing most scholars take into account when they look at questionable finds, is their own

Fig. 2 – Mechanically reduced industrial waste flint.
The shapes in this picture resemble from left to right a bifacial tool, scraper and blade (*batonnet-clivage*) and at the bottom two flakes. In fact all these shapes form by chance when flint waste is mechanically reduced using bipolar pressure. Therefore it will not come as a surprise that these forms also occur in the "Fagnian".

experience. Professor Wil Roebroeks calls this experience "gut feeling" (van der Drift, 2007). Non-Acheulean assemblages are often perceived as strange angular and obtuse forms that can hardly be effective tools (the reasons why hominids nevertheless used these seemingly ineffective bipolar toolkits instead of freehand flakes are discussed in van der Drift 2009). The experience based "gut feeling" therefore leads to a rejection. The lower number of acute angles and CF marks in these non-Acheulean assemblages also lead to rejection.

The next argument in distinguishing non-Acheulean assemblages is of course the context. This is a valid argument, the context of the Oligocene deposits conclusively proves that the "Fagnian" cannot be of hominid provenance. And the context of road pavement deposits conclusively proves their provenance from mechanical reduction processes. In strict manuport conditions (i.e. travertine) the artificial provenance is obvious. But we are creating a very high threshold if we demand that all non-Acheulean assemblages must be found in travertine. If we were to make such demands for Acheulean assemblages, few would withstand rejection.

This leaves us with the commonly used argument of shape-comparison in individual pieces. This argument is very weak as it was clearly the selection of shapes that led Rutot and his fellow eolith collectors to create their Sammelsuriums. I would like to underline this by showing two shapes that resemble artefacts. In the "Fagnian" collection there are rare shapes that resemble borers or reamers and rare elongated shapes (classified by Rutot as "clivage" and in Palaeolithic assemblages called "batonnets") that resemble blades or cores. Of course the Oligocene context overrules the credibility of such shape arguments completely.

4. Comparing complete assemblages

When I show scholars my bipolar artefacts, they immediately respond by comparing the finds to the "Fagnian". But when I visited this important historical collection in the Royal Belgian Institut of Natural Sciences, all of my expectations were confirmed within seconds. Both the "Fagnian" and my assemblage from Gulpen (van der Drift, 2007) are the result of bipolar reduction from eluvial flint, that is where the comparability begins. But that is also where the comparability of the complete assemblages ends. The weak point of my statement is that it is built upon my 30 years of experience with bipolar assemblages, mechanically reduced flint and experimenting. You could therefore argue that I am now putting my own "gut feeling" in favour of the "gut feeling" of scholars.

So we must look for arguments that hold their ground. When an assemblage has the pretence of completeness, you could try to make a typological

Fig. 3 – Bipolar artifacts from Gulpen.
The top and ridges of the large anvil are littered with percussion marks. Percussion marks are absent in the "Fagnian". On the anvil on the left side lies a scraper with deep notches (denticulate). The chances that nature imitates such deep notches are almost nil. The artifact on the anvil on the right is bifacial and the artifact next to the anvil has been chipped multidirectional.

group comparison with for instance the non-Acheulean layers in Tautavel, by counting the number of bifacial forms, the number of denticulates, the number of Tayac points and so on. In some cases (i.e. Kelderman & van der Drift, 2003) where non-selective collecting was pursued we have done this. But most collections present a selection. Therefore one could reason that the high percentage of bifacial implements and multidirectional cores we find could be explained by selective collecting of shapes, rather than hominid provenance. So counting the number of certain shapes (selecting within the selection) cannot bring a convincing proof.

The first thing I noted when I inspected the "Fagnian" is that the fractures originated in different eras. This is due to the slow erosion of the Cretaceous chalk layers during the Palaeocene, Eocene and lower Oligocene. The chalk dissolved and the remaining flints broke under pressure. In that process a flake could originate and a million years later pressure could chip this flake into a scraper shape. In a later stage all shapes became water-worn (Oligocene transgression and possibly in streams), this obscured some of the differences in patina. The patina is significantly different in the collections we claim to be of hominid provenance. There the patina is always homogenous. Mechanically reduced flint waste assemblages also show a homogenous patina (freshness).

The "Fagnian" consists of water-worn angular eluvial flints. The same material is very common around Vaals, Gulpen and in the adjacent part of Belgium (Hoogcruts formation). Such water-worn angular flints were used as raw material in my Gulpen assemblage (van der Drift, 2007). For a better understanding you could say that if we were to use the "Fagnian" collection today as the raw material for an experiment in which we make bipolar tools (and let an ice age pass to develop patina) we would end up with a group that is similar to the Gulpen assemblage.

It is very important to note that some technical differences between artefact groups and the "Fagnian" are clear without counting shapes. First

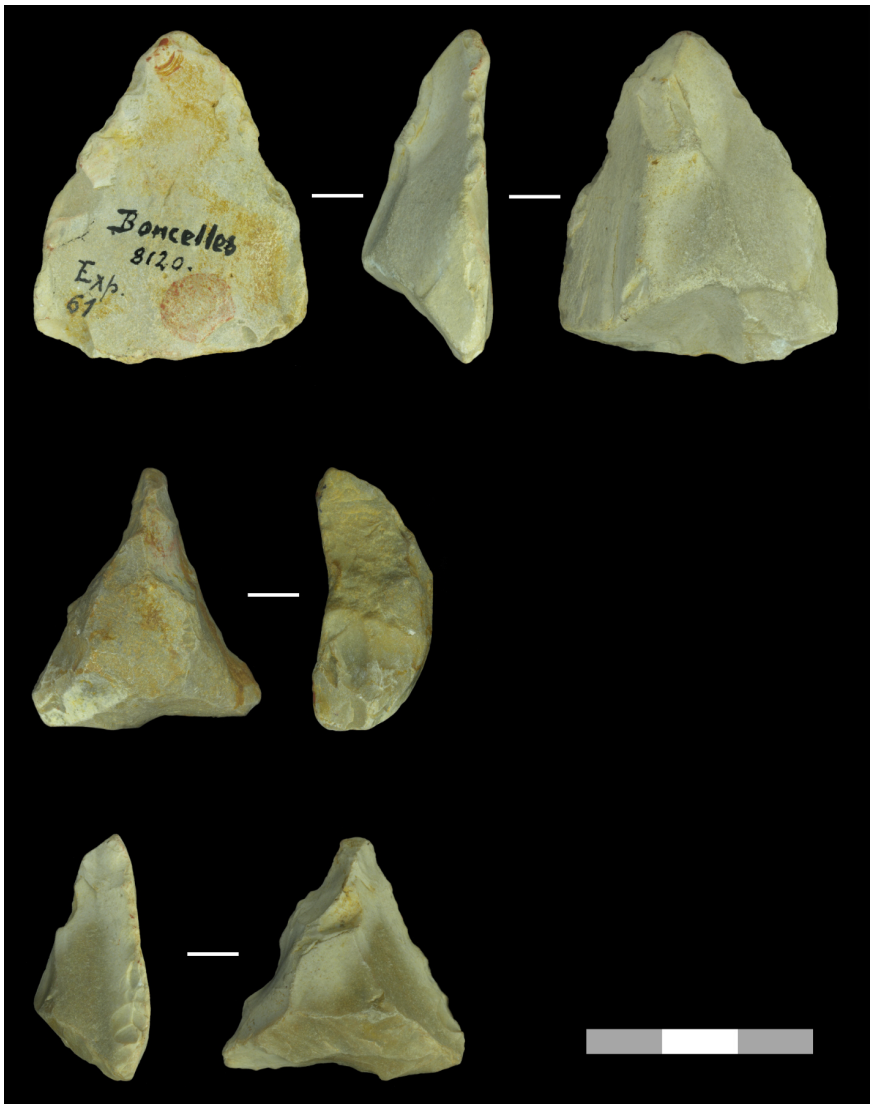
a

Fig. 4ab – Boncelles collection. In the "Fagnian" collection we see the same shapes as in the mechanically reduced flint waste. Shapes that resemble scrapers are most common, very rare are for instance the borer-reamer and blade (*batonnet-clivage*) resembling shapes that are shown here. Photos: Éric Dewamme, Royal Belgian Institute of Natural Sciences.

of all when we use flints as a hammer or anvil in experiments, these flints become littered with percussion marks. The "Fagnian" in complete contrast shows absolutely no signs of percussion. The flints that Rutot has diagnosed as hammers and anvils of "Tertiary man" show only pressure fractures. The hammers or anvils in the collections in Peeters *et al.* (1988) and in my experiment however are littered with percussion marks just like their experimental counterparts. Just like in the "Fagnian", percussion marks are absent in mechanically reduced flint waste. Hammers or anvils littered with percussion marks therefore point to a hominid provenance.

In previous publications I have explained that on physical grounds it is very difficult for nature to make deep notches, because deep-notching requires the combination of an anvil, a directed force and soft support by hand (van der Drift 1991, 2001, 2007, 2009). As I expected, deep notches turned out to be very rare in the "Fagnian" from Boncelles. I did note a large scraper-shape with two deep notches and a large piece with one deep notch resembling a bill-hook. But running my finger through these deep notches, it was very evident that these notches were not water-worn. This relative freshness of these fractures makes it clear that they are post-depositional damages, probably originating from quarry activities such as the use of picks (directed force whilst supported by a hard anvil and soft Oligocene sands). Deep notches are equally rare in mechanically reduced flints. In

b



exceptional cases they are created on road surfaces by a directed force (heavy rollers or horseshoes) whilst the flint is supported by a hard anvil and soft ground. The absence of deep notches in the water-worn objects from the "Fagnian" collection confirmed my earlier conclusion, that deep notches point to a hominid provenance.

5. Conclusions

The lack of understanding of bipolar artefacts has often led to debate and rejection. A well known example in Belgium is the debate on the bipolar Belle Roche (Sprimont) assemblage. Considering the limitations of the context, Roebroeks (1986) suggested a natural origin. Sprimont is (in a tip of the iceberg fashion) illustrative for the need to understand bipolar fractures and their role in artificial, natural and mechanical assemblages. Recognising that percussion marks and deep notches are strong indicators for a hominid provenance can be an important contribution in this debate.

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Jan Willem van der Drift
Scharneweg, 1
NL – 6224 JA Maastricht (Netherlands)
janwillemvanderdrift@wanadoo.nl