The Acheulean Handaxe at Boxgrove

Tony Baker
May 30, 2007

I stepped out of my comfortable arena of New World, Paleoindian archaeology and into the Old World Paleolithic with my first paper on the Acheulean Handaxe in 2006. There I wrote:

The Lower Paleolithic researchers who believe the Acheulean handaxe was the desired product do not find their justification in its function, since its function is not understood … Instead, they find their justification in its unchanging morphology. For a million plus years, its basic shape remained constant as it spread across three continents.

I further pointed out that this desired-product belief can be traced back to the end of the eighteenth century and John Frere. Then I proposed a different belief, which was the handaxe was actually only the by-product and flakes were the desired-product. The remainder of the paper was then justification for that belief from a morphological perspective.
Since writing that first paper I have had numerous discussions with colleagues about this dichotomy of the desired-product versus by-product. I have discovered that the opinions on the subject are quite strong. Often, it was suggested that I read the Boxgrove literature and this might convince me to change my mind. So I read *Boxgrove: A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex*, which is the monograph of the site at this time. To my surprise, instead of containing evidence to support the desired-product belief, I found that the desired-product belief was the inherent assumption stitched through out the book. But first, why Boxgrove?

Boxgrove is an archaeological site on the southern coast of England and it is the archaeologist’s dream. It is a unique Acheulean site in that it contains “… the presence of *in situ* working floors…” (McNabb 2000:439). It has a date range of between 524 and 420 kyr bp, and “the stone tool assemblage, all of which is made from local flint, is dominated by the production of handaxes” (Roberts and Parfitt 1999:xix). It has even yielded a tibia that “… can only definitely be assigned to Homo sp with possible affinities to either H. heidelbergensis …, H. erectus …, H. neanderthalensis …, or H. sapiens…” (Stringer and Trinkaus 1999:420).

As stated above, I found the desired-product belief to be an assumption in the Boxgrove monograph. For example, consider again from the above paragraph, “the stone tool assemblage … is dominated by the production of handaxes.” This comes from the summary at the beginning of the monograph. Though out the discussion of the lithics and their relationship to the archaeological record, flakes are referred to as waste flakes as in the following: “It (assemblage) comprised in the main waste flakes from the production of handaxes and five finished bifacial tools” (Austin, L. A. et al 1999:315). Or, “The debitage from areas Q1/A and Q1/B is the waste from handaxe production” (Austin, L. A. et al 1999:341). In the concluding remarks to the archaeology chapter, which is also the end of the monograph, one finds:

> It has been argued that as the lithic assemblages of the earliest occupants of northern France and the United Kingdom are dominated by handaxes, then the source area for the European hominids was from the Levant and Africa, where handaxes were in use from c 1.5myr bp, more so as handaxes appear later in the archaeological record of Asia and central and eastern Europe. Whilst this hypothesis is persuasive, it must be remembered that handaxe manufacture is very much determined by raw material sources … and caution must be exercised in using tool types as sources fossils. (Roberts 1999:423)

As there was no attempt to test the desired-product belief against the Boxgrove archaeological record in the monograph, I have attempted to do it here. Simultaneously, I tested my by-product belief in a similar manner. Since I have never been to the site and have only seen the artifacts at the British Museum, the monograph is my view of the Boxgrove’s archaeological record. The following is a discussion and results of that testing.
Theories and Models

I have taken the position in this paper that the handaxe was the desired-product is a theory. I know that many researchers would argue that it is more than just a theory, and instead, that it is a fact. However, I have seen no evidence or read anything to date that makes it a given for me. In my mind it is only a theory that needs to be tested, as is the competing theory that the handaxe was the by-product. One way to test these theories is to make predictions from them and then compare the predictions against the archaeological record.

A theory is similar to the title of a book; it contains no details. “The devil is in the details” as the old saying goes. So, I created the details, which I call a life history model. The detailed life history models for the two theories are depicted in Flow Chart 1. From these models, I formulated my predictions to compare against the archaeological record, which in this case is the archaeological record at Boxgrove.

Important points I want the reader to note about the models in Flow Chart 1 are that first, each represents the life history of a single chunk of rock, from the time it is first selected until its final discard into the archaeological record. Next, the locations marked on the left side are different locations on the landscape. However, unlike stratigraphy where moving down is moving back into time, moving down in these models is moving forward in time. Thirdly, from this follows that the chunk of rock is getting smaller (more reduced) as it moves downward in the Model.

The dotted lines that separate the locations do not represent the same point in time in the two models. For example, the Desired-Product Model (DPM) assumes a single individual or immediate group associated with the life history of the handaxe. So, at a maximum the handaxe would have a life history equal to that of the remainder of its creator’s life. In contrast, the By-Product Model (BPM) does not assume a single individual. So the rough-out can lie at Location 1 for hundreds of years before it is again acquired at the beginning of Location 2. Its life history can be hundreds or even thousands of years long. It is even possible that it could have been acquired from an eroded surface many thousands of years older than the surface of its final discard.

The concept of the rough-out, handaxe, and finished handaxe needs some elaboration. As I understand the DPM, it consists of two stages of reduction. The first stage of flake removal is from a core that the archaeologists would identify as a rough-out. The second stage of reduction is from a core that the archaeologist would identify as a handaxe. At the end of the second stage of reduction the handaxe is “finished” and ready for use. Schematically, this looks like Flow Chart 2.
I have not found a definitive definition for the transition from rough-out to handaxe. This same statement applies to the transition from handaxe to “finished” handaxe. I suspect there are no definitions and, therefore, these transitions vary from archaeologist to archaeologist. However, for my purposes I have retained these concepts of rough-out, handaxe, and finished handaxe.

The concept of the rough-out must also exist in the BPM. Since there is no definition for the rough-out/handaxe transition, I have assumed it occurs at some location beyond Location 1. I made this assumption because this model assumes that flakes are the desired products, and I believe sufficient flakes would have been extracted and the core discarded at Location 1 before the rough-out/handaxe transition was crossed.

I have tried to create the DPM and BPM as polar or diametric as possible, because I wanted to avoid ambiguous results. In different words, I wanted to be able to see differences in the archaeological record that would favor one of the two models. For example, if I had created a DPM with the roughing-out of the handaxe occurring at a separate location from that of the finishing the handaxe, then this model would have been closer to the BPM, which would have increased the chances of ambiguity. Ambiguous results favor neither model.

A Few Definitions

I have included this short section because I want the reader to fully understand the way I am using some terms.

In this paper I recognize three types of core artifacts:

- Rough-out – a core in the early stages of reduction and on a trajectory to becoming a handaxe.
- Handaxe – a core that has ceased being a rough-out and now is on a trajectory to becoming a finished handaxe.
- Finished handaxe – a tool ready for use.

I also recognize two types of flakes:

- Roughing-out flake – a flake that is removed from a rough-out. Newcomer has defined them as tending “… to be thick, and have varying amounts of cortex on their dorsal surfaces. Butts are usually wide and plain (or cortex) and bulbs and cones of percussion and undulations on the ventral surface are well developed” (1971:88).
Thinning/finishing flake – a flake that can come from a rough-out or a handaxe. I have combined two of Newcomer’s flake types into one category. They are hard to separate from each other and their combination here is insignificant. Newcomer states thinning flakes “… are typically thin with all edges feathered, undulations on the ventral surface poorly marked, and have scars of other flat, skimming flakes on their dorsal surface. They are often curved in profile and their butts either punctiform, linear or shattered” (1971:88). He says finishing flakes “… superficially resemble Levallois flakes in the configuration of their dorsal surface, but are thinner and have a flatter bulb of percussion …” (1971:90).

Refitting -- the process of finding two or more flakes that fit together. These flakes have surfaces on their faces that are perfect mates to each other. In this paper, refitting is not intended to mean pieces of a broken flake that fit together at their edges.
The Predictions

The following predictions of assemblages to be found at excavated locations are based on the two models in Flow Chart 1. There is the obvious assumption that at these locations the artifacts were frozen in the archaeological record at or very near the exact positions they were discarded or lost by their makers and users. This is the basic interpretation of horizons 4b and 4c that have been excavated at Boxgrove (Austin, L. A. et al 1999).

**Desired-Product Model – Location 1**
At these locations the handaxe is created and often used. Therefore, a complete suite of reduction flakes from roughing-out to thinning/finishing flakes should be present. These flakes should all refit. The associated handaxe may or may not be present depending if it was discarded or curated. If the handaxe is present, the flakes should refit it. A variation in the predicted assemblage would occur if the rough-out/handaxe was abandoned before reaching the finished handaxe stage. However, even in this case, all the flakes should fit either the abandoned rough-out or handaxe.

**Desired-Product Model – Location 2 and Subsequent Locations**
At these locations, the finished handaxe is curated in, used and possibly curated out. If it was resharpened, then a few thinning/finishing flakes may be present. If both are present, the flakes should refit it.

**By-Product Model -- Location 1**
At these locations, the nodule’s reduction is initiated. Therefore, roughing-out flakes will be present and should represent a refitting sequence, except for gaps that represent the selection/use of flakes. Since use may have altered these flakes beyond recognition or the use may have occurred off the excavation location; these flakes create gaps in the refitting sequence. The rough-out may or may not be present. If present, flakes will refit to it.

**By-Product Model – Location 2 and Subsequent Locations**
At these locations the rough-out is further reduced. At some location, maybe at Location 2 or maybe a subsequent location, the rough-out becomes a handaxe. At these locations any combination of core (rough-out, handaxe, or finished handaxe) and flakes are possible. If both are present, they all will refit, but the earliest roughing-out flakes will be missing. Also, some flakes in the refitting sequence will possibly be missing because of selection/use. Selection/use can also eliminate all flakes.

From the above generalized predictions, Tables 1 and 2 were developed to present the same information in a friendlier form.
### Table 1 – Assemblage Predictions from the Desired-Product Model (DPM)*

<table>
<thead>
<tr>
<th>#</th>
<th>Core</th>
<th>Flakes</th>
<th>Refitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>rough-out or unfinished</td>
<td>complete suite of rough-out flakes and/or</td>
<td>flakes and rough-out or unfinished</td>
</tr>
<tr>
<td></td>
<td>handaxe</td>
<td>thinning/finishing flakes</td>
<td>handaxe refit</td>
</tr>
<tr>
<td>2</td>
<td>finished handaxe</td>
<td>complete suite of rough-out and</td>
<td>flakes and finished handaxe refit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thinning/finishing flakes</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>---</td>
<td>complete suite of rough-out and</td>
<td>flakes refit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thinning/finishing flakes</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>finished handaxe</td>
<td>incomplete suite of thinning/finishing</td>
<td>flakes and finished handaxe refit, with no</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flakes</td>
<td>gaps, and flakes are the last removals</td>
</tr>
<tr>
<td>5</td>
<td>---</td>
<td>incomplete suite of thinning/finishing</td>
<td>flakes refit, with no gaps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flakes</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>finished handaxe</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

* Any, all, or any combination is possible at a single location.

### Table 2 – Assemblage Predictions from the By-Product Model (BPM)*

<table>
<thead>
<tr>
<th>#</th>
<th>Core</th>
<th>Flakes</th>
<th>Refitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>rough-out</td>
<td>incomplete suite of rough-out flakes</td>
<td>flakes and rough-out refit, but gaps in</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sequence</td>
</tr>
<tr>
<td>2</td>
<td>---</td>
<td>incomplete suite of rough-out flakes</td>
<td>flakes refit, but gaps in sequence</td>
</tr>
<tr>
<td>3</td>
<td>unfinished handaxe</td>
<td>incomplete suite of late rough-out and/or</td>
<td>flakes and handaxe refit, but possible gaps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thinning/finishing flakes</td>
<td>in sequence</td>
</tr>
<tr>
<td>4</td>
<td>rough-out</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>5</td>
<td>finished handaxe</td>
<td>Incomplete suite of late rough-out and/or</td>
<td>flakes refit, but possible gaps in sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thinning/finishing flakes</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>---</td>
<td>Incomplete suite of late rough-out and/or</td>
<td>flakes refit, but possible gaps in sequence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>thinning/finishing flakes</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>finished handaxe</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

* Any, all, or any combination is possible at a single location.

In summary, the presence of a rough-out or unfinished handaxe without refitting flakes is a signature for the BPM because these core types are not curated in the DPM. However, the presence of an isolated finished handaxe is ambiguous as it can occur in either model.

The presence of a gap (missing flakes) in a refitted sequence is also a signature for the BPM. However, there are times when the gap is not visible because it exists at the beginning or end of the sequence. For example suppose four flakes are removed that refit. If the BPM is operating, the odds of selecting a flake from the ends of the sequence and making it a three flake series are 50%. So does a three flake series support the DPM or the BPD? It can support either and therefore is ambiguous. The other 50% of the time a flake from the interior of the sequence is selected, which yields a two flake series and an isolated flake. Unless there is a core, to which the three flakes fit and demonstrate that there is a gap, the three flakes are seen as two flakes that refit and an isolate flake. Again, this result is ambiguous. Therefore, a sequence of refitted flakes without a gap is ambiguous and offers no support for either model.
DPM and BPM Signatures at Boxgrove

The following observations are derived entirely from the monograph *Boxgrove: A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex* edited by M. B. Roberts and S. A. Parfitt. More narrowly, they are from Chapter 6.2, titled “Archaeology of excavated areas” by Austin et al. Therein are extremely detailed discussions of five different excavated loci and specifically horizons 4b and 4c and their time equivalents. Horizons 4b and 4c are part of the Slindon Silt member of the Slindon formation (Table 9a) and contain the “in situ working floors”.

The best signature for the DPM is a single rough-out with its 15 flakes from Quarry 2/A-4c. All flakes and rough-out refit to create the original nodule. There are no missing flakes or gaps in the sequence (360). This is not the strong signature one would wish for to drive home the DPM. And, a complete refitted sequence of finished handaxe and flakes would be a stronger signature. That said, this still is evidence for the DPM because if flakes were the desired product, which is the premise of the BPM, why were all 15 of these rejected? Or, why was the reduction process abandoned before acceptable flakes were created? The only answer is the trajectory of the reduction was not moving in the desired direction for the creation of a handaxe. This observation conforms to DPM prediction #1.

Another refitting example was found at the horse butchery site or Quarry 2/GTP17-4b. Here a nodule was restored and “… over 70% cortex on its outer surface…” was recovered. The interior was missing, and “the void in the middle of the nodule conforms to the shape of an ovate handaxe rough-out” (373). Unlike the previous example, this refitting sequence is a signature for the BPM. There are gaps in the sequence, which is evidenced by only 70% of the cortical flakes being recovered. Furthermore, why is the rough-out missing? Curating a rough-out does not conform with the DPM. However, being recycled at a later time does conform to the BPM. Therefore, this refitting example is a strong signature for the BPM. This observation conforms to BPM prediction #2.
More support for the BPM comes from gaps in refitted sequences from the following two locations. These conform to prediction #6.

“The group comprises a series of (24) soft hammer flakes removed in order to thin down a specific section of a previously worked piece. Two of the larger removals are missing from the scatter. Their complete absence suggest that they were deliberately removed.” This group was from Quarry 1/A-4b. (335)

“This sequence of six flakes represents an attempt to thin down two break surfaces on opposite lateral edges of the same handaxe. The first two flakes in the sequence were removed from one edge of the handaxe. A third flake was removed as part of this sequence from the same edge, but was not recovered. It is likely that it was incorporated into the sediments outside the excavation area. After the missing flake, a sequence of four flakes were removed on the same face as the previous removals but from the opposite edge of the handaxe.” This sequence was from Quarry 1/B-4c. (349)

Quarry 1/B-4c yielded eight handaxes in addition to the six-flake sequence mentioned immediately above. Only one of the eight had refits and these were the last three removals. If this artifact was a finished handaxe, it would fit the prediction #4 of the DPM. However, the authors indicate “…this handaxe was abandoned before it was finished” (344), so it conforms to the BPM #3.

The remainders of observations I made of the archaeological record in the Boxgrove monograph are ambiguous. For example, there are a number of refitted flake series that can support either model, as discussed above. There are numerous isolated-finished handaxes that have been recovered and these can support either model. So after eliminating the ambiguous data, the final scorecard from this exercise is 4-1 in favor of the BPM. There are four examples that conform to the By-Product-Model and only one example that conforms to the Desired-Product-Model.

Ambiguity

The above scorecard of the archaeological record from the Boxgrove monograph, which favors the BPM, is founded solely on the life history models in Flow Chart 1. As I stated in the beginning these are the devilish details that I created for each theory. Changing the details of the models obviously can alter the results. The authors of the monograph envision a DPM that permits staging of the reduction at several different locations. For example, roughing-out at one location and thinning and finishing at another (1999:348, 353, 373 & 376). Their model is closer to the BPM in Flow Chart 1. With this model the rough-out from Quarry 1/B-4c with three refits becomes ambiguous and the scorecard changes to 3-1 in favor of the BPM. If the DPM is further altered to allow for the creators of the handaxe to select and use flakes from the reduction process, then the signature gaps of the BPM become ambiguous. This too is part of the author’s DPM (1999:315, 329 & 335). So, the scorecard now reads 0-1 in favor of the DPM.
The above differences between the author’s DPMs and mine do not cause the support for my BPM to change to their DPM. Instead, they cause the support to become ambiguous and go away. Compare the first scorecard of 4-1 in favor of the BPM and the last of 0-1 in favor of the DPM. In retrospect, this is not surprising when one compares the difference between the author’s DPM and my BPM. Both have the handaxe being reduced at numerous locations. Both have flakes being selected-out for use as tools. The only difference is the authors believe that every handaxe was created to be used as a tool and possibly curated and reused. I do not. Instead I believe the handaxe was the continuous by-product of flake extraction, and only occasionally was itself used as a tool. This difference may appear to be subtle, but it is not. This is really the difference in the level of cognition the advocates of the two theories are assigning to the creator of the handaxe. The advocates of the DPM see cultural tradition with intent and planning. I see only the intent to acquire the simplest of tools, which are flakes. Unfortunately, this cannot be resolved at Boxgrove until all participants agree on the same life-history model for the handaxe.

Conclusion

This paper began with the opportunity to read the Boxgrove monograph. With the first reading, I believed I saw evidence, hard evidence that would support my belief that the Acheulean handaxe at Boxgrove was only a by-product of flake extraction. This would have been further support for my previous paper (2006) on the subject. However, as I created the life history models in Flow Chart 1 and began to write, the armor of my logic began to show cracks. Numerous times I was forced to rethink the logic and alter my writing. Upon finishing the paper, I discovered, the conclusion I had reached herein is not what I had originally intended. The conclusion is that the Boxgrove archaeological record is ambiguous about whether the handaxe was the desired-product or only a by-product. This ambiguity is the result of different beliefs of the advocates of the two theories and not the archaeological record. And, future wear/use studies on the handaxes and flakes will not resolve this ambiguity because both of the advocates see the handaxe and flakes being used as tools. Unfortunately, this is about as satisfying as that old cliche of “kissing one’s sister.”

Acknowledgements

This paper is the result of two people. Alan Slade first introduced me to the wonders of the artifacts of the Lower Paleolithic at the British Museum. Later, he became my most strident opponent of the belief that the Acheulean handaxe was a by-product of flake extraction. In a sense, this paper is written to/for Alan.

Phil LeTourneau, who has been a dear friend and colleague over the last 10+ years, excavated at Boxgrove in 1990 as a graduate student from the University of New Mexico. It was only recently that I learned this envious fact. The photographs herein are Phil’s. Plus, and most important, he loaned me his copy of the Boxgrove monograph for the last six months, which made it possible for me to write this paper. I am going to hate to return it to him, as I feel it belongs on my bookshelf. Thanks Phil.
References

Austin, L. A., C. A. Bergman, M. B. Roberts, and K. L. Wilhelmsen

Baker, T.

McNabb, J.

Newcomer, M. H.

Roberts, M. B.

Roberts, M. B. and S. A. Parfitt (editors)

Stringer, C. B. and E. Trinkaus