The Afon Ystwyth Experiment Archaeology Project

Summary of the experiments undertaken and the main conclusions from the 1st phase of the project (2000-2003)

The Experiments

21 individual experiments were undertaken between September 2000 and July 2003. These can be summarised as follows:

1. Biface tracer experiments (Llanilar). Replica bifaces were emplaced across the Afon Ystwyth channel and recovered (where possible) after transportation.

2. Biface tracer experiments (Llanafan, Grogwynian Reach). Replica bifaces were emplaced on the vegetated floodplain, point bars and midstream bars and recovered (where possible) after transportation and/or modification by aerial and sub-aerial processes.

3. Flake tracer experiments (Llanafan). Replica flake scatters (knapped in situ and pre-knapped) were emplaced on the vegetated floodplain and point bars and recovered (where possible) after transportation and/or by modification by aerial and sub-aerial processes.

1. Biface Experiments (Llanilar)

The positions of all the emplaced bifaces were 3-dimensionally surveyed. The orientation and dip of the bifaces was also recorded. The key conclusions from the Llanilar biface experiments are as follows:

1.1 Bifaces have a tendency for both in situ burial and transportation.
1.2 The tendency of an individual biface for burial or transportation relates not only to flow velocity (i.e. flood magnitude) but also to the local river bed morphology.
1.3 Bifaces may be subject to abrasion development while in phases of partial burial, as well as during periods of active transportation.
1.4 The development of diagnostic transport features (e.g. edge micro-flaking and incipient percussion cones) may be hindered in fluvial environments with a significant vegetation (algae) component.

A 'buried' biface during excavation, at the Llanilar Study Site

2. Biface Experiments (Llanafan)

The positions of all the emplaced bifaces were 3-dimensionally surveyed. The orientation and dip of the bifaces was also recorded. The key conclusions from the Llanilar biface experiments are as follows:

2.1 Bifaces have a tendency for both in situ burial (Figure 3) and transportation.
2.2 Bifaces demonstrated potential for burial within fine-grained floodplain and bar form sediments.
2.3 Transportation distances (and therefore step lengths) tend to be relatively short (this assumes that the majority of unrecovered bifaces were buried rather than transported downstream of the study area).
2.4 Bifaces may be subject to abrasion development and related damage while in phases of partial burial, as well as during periods of active transportation.
2.5 The development of incipient percussion cones may occur over short distances.

A partially 'buried' biface, at the Llanafan Study Site

3. Flake Experiments (Llanafan)

Flake scatters were emplaced at the Llanafan site, to explore the transformation of flake materials as a consequence of fluvial disturbance and other aerial and sub-aerial processes. A total of 13 scatters were emplaced, of which 4 were knapped in situ, and 9 were pre-knapped and emplaced to mimic the spatial density of a scatter knapped in situ. Scatters were pre-knapped as it enabled the recording of flake weight and the a, b and c-axes. It also facilitated material identification and recovery (pre-knapped scatters were individually numbered). As the main focus of the experiments was flake movement, it was considered to be more important to record accurate size data than to create 'authentic' knapping scatters. Two flake dimensions (a and b-axis) were recorded for the in situ knapped scatters. The orientation and dip of all flakes were recorded after the scatters were emplaced.

An experimental flake scatter, emplaced on a gravel bar at the Llanafan Study Site

In general, the key conclusions from the Llanafan flake experiments are as follows:

3.1 Flake scatters demonstrate a degree of structural integrity, with flakes being transported short distances (generally sub-10m) in the initial phases of fluvial dispersal.
3.2 However, flakes are transported significant distances during subsequent dispersal phases (demonstrated minimum of 80m).
3.3 Flakes are damaged during transport episodes, but while this damage may modify the specific morphology of individual flakes (see below), it does not modify them beyond the point of recognition as anthropogenic flakes.
3.4 High percentages of the transported flakes display varying degrees of edge micro-flaking. As transportation distances and the quantities of micro-flaking increase, it is suggested that the micro-flaking increasingly resembles intentional retouch.
3.5 Flake material from separate scatters (knapped in relatively close spatial proximity) tends to become spatially indistinguishable during fluvial dispersal.

Micro-flaking on a transported flake

Floodplain Monitoring

A photographic archive was recorded between May 2000 and July 2003, documenting the evolution of the Afon Ystwyth floodplain at the Llanafan site:

i. Variations in gravel bar type. In response to changes in water levels, the barforms varied between point bar complexes and complexes of midstream barforms intersected by minor channels. The midstream barforms displayed varying levels of fragmentation in response to specific water levels.

ii. Variations in bar presence, due to fluctuations in channel width and depth, water levels and (possibly) sediment transport.

iii. Vegetation development. Patterns in the locations of semi-stable vegetation provided a 'negative' image of the position of the 'overflow' channels that fragmented the barforms during periods of high water levels. The presence of vegetation also indicated relatively highly elevated sections of the barforms, which were clearly rarely inundated by flooding. The presence of this semi-stable vegetation therefore indicated that, over relatively short periods (e.g. the 3 years of this study), the location of 'overflow' channels and the fragmentation of barforms follows repetitive patterns in response to high level flows and flooding events. Over slightly longer time-spans, the distribution of vegetation on the floodplain to the south of the main channel indicates shifting patterns in the distribution of the main channel. From east to west, the transition from vegetation (grasses and shrubs) to bare gravel and silt, to partial vegetation (shrubs and some grasses) suggests the relatively recent existence of a major palaeochannel flowing from north to south across the floodplain.

iv. Variations in channel types and locations. The major channel of the Afon Ystwyth showed considerable variation in width between periods of low and high flow. There was also an extensive development of multiple channels associated with the barform complex at the upstream end of the study site. Finally, during periods of extremely high flows there was evidence of 'overflow' channels fragmenting the floodplain to the north of the main channel.

v. Erosion. There was extensive evidence of bank erosion at the downstream end of the study site. It has not been possible to accurately measure the quantities of bank erosion that have occurred (due to difficulties of access), although the undercutting of fence lines has provided a subjective measure of erosion rates in this part of the Llanafan site (Figure 6).

Bank erosion at the Llanafan Site

Summary

Overall, the first phase of the project has provided valuable information with respect to the processes of stone tool transport and modification, which are important for the interpretation of secondary context stone tools assemblages from the Lower and Middle Palaeolithic archaeological record.