
New methods in use-wear analysis

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Since the pioneering work by Semenov use-wear research has brought in new methods to improve the accuracy of functional interpretations and promote a greater understanding of how and why use-wear develops on stone tools. After the introduction of use-wear analysis into the West with the publication of Semenov's book (Semenov, 1964), contributions were made firstly by researchers using predominantly low power microscopy concerning fracture mechanics and how resulting fractures related to tool use kinematics.

The Vancouver conference in 1977 (Hayden, ed., 1979) was mainly concerned with this aspect of use-wear while workers using high power microscopy concentrated their research on isolating polishes that were attributable to particular tool uses (Keeley, 1980). The use of blind tests was also introduced at the Vancouver conference with the Keeley-Newcomer test (Keeley, Newcomer, 1977).

The Tübingen conference of 1985 (see *Early Man News* v. 9, 10, 11, 1986) presented two blind tests with, frankly, poor results (Unrath *et al.*, 1986, Newcomer *et al.*, 1986), which led to call for further investigation into how distinctive the polishes were and to an appeal for more work on polish formation that would provide a theoretical background for testing the distinctiveness of polishes to specific worked materials. In particular,

work on the quantification of microwear polishes was called for to put use-wear analysis on a more scientific footing. Work in both these areas was in progress (for example Grace *et al.*, 1985, on quantification using image processing ; Lévi-Sala, 1986, on polish formation).

At the Valbonne conference in 1987 (Beyries, ed., 1988), the technique of profilometry was presented (Beyries *et al.*, 1988), and the publication of that conference contained a paper by Knutsson *et al.*, 1988 on the use of image processing. Also at that conference a new blind test was presented that achieved significantly better results by combining low and high power observations and looking at the interrelationships between fractures and polish (Grace *et al.*, 1988).

The Uppsala conference in 1989 was mainly concerned with theoretical issues (Knutsson *et al.*, ed., 1990) but methodologically a consensus emerged so that different approaches (high and low power) were not seen as competing techniques but alternative strategies dependent on the specific archaeological problem.

The New Methods Section of the Liège conference continued these developments in the two main areas of use-wear methods and polish formation. The combining of both low power and high power observations within the framework of

a computerized expert system was presented, and the polish formation issue appears to have been resolved particularly from the contributions of Lévi-Sala, and Yamada and Sawada, who were able to present some results from the significant research being carried out in Japan. The polish formation theories can be summed up as being the alternatives of silica gel formation in an « additive » process, or the removal of material from the stone surface with an « abrasive » process. From the work of these researchers it would now seem conclusive that the process is abrasive and that silica gel is not formed. This has important ramifications in relation to the proposed trapping of residues in the silica gel such as plant phytoliths that was suggested by Anderson-Gerfaud (1980), and supports the findings from the quantification of polishes, *i. e.* that they are not specifically associated with a worked material (Grace, 1989 ; Rees *et al.*, 1988).

The use-wear literature over the last 15 years has been seen by some as contentious. I would characterize this « contentiousness » as healthy debate. Any scientific discipline advances by challenging ideas and hypotheses with the intention of acquiring new knowledge that advances the subject. This has been the pattern of use-wear research. When a hypothesis or technique is superseded this does not denigrate the original idea but takes the stimulus of that idea as a starting point from which to progress. I was particularly pleased to hear Atsushi Sawada say at the end of his paper : « I think we can find out a lot more than Grace thinks », and I'm sure they can. New methods do not replace old ones because they were wrong, they are developed to improve existing methods so that the whole subject may advance.

Use-wear research has progressed at a rapid rate over the last 15 years, perhaps faster than most new disciplines within archaeology. Use-wear analysts may have tried to run before they could walk and consequently sometimes tripped

themselves up, but the subject has reached a position where use-wear analysts can now walk tall. Other archaeological disciplines would benefit from the rigor that has been applied to use-wear research, incorporating experimental replication and use of stone tools, quantification methods, research into the materials science aspects of use-wear, expert systems, blind tests etc. It is hoped that research will continue into new methods of improving use-wear analysis and that practitioners will not fall into the trap of complacency, like the conference participant who, when asked about his methodology, replied : « I use a microscope ».

It has been claimed by some practitioners that their methodologies have always encompassed a whole range of use-wear attributes, and this may be so. But the results of use-wear analysis depend on the methodology, so the methodology should be explicit and described in some detail, or we return to a situation of accepting, or rejecting, the use-wear interpretations as a matter of faith.

Though there is a great deal of work still to be done it should be pointed out that recent blind tests have produced results that are more accurate than, for example, ¹⁴C dates, which only have a 68 % probability of falling within the date range of any given standard deviation. Also use-wear data have been incorporated into more general interpretations of archaeological sites rather than simply producing lists of tool uses. Advances in both the practical and theoretical aspects of research mean that use-wear can make a significant contribution to stone age studies and go a long way to answer those perennial questions : What were they doing ? How were they doing it ? And why ?

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