

A Role for Microwear Analysis in Archaeology

Emily H. Moss

This paper is addressed to the nature and relevance of the study of wear traces on stone tools to artifact typology. I suggest that typology ought to be relieved of the burden it has had to carry in the name of style and function and that it is a ready-made sampling technique for wear studies.

At this stage in the development of microwear analysis there are several schools of thought, and there are several methods of research. The method I use is that developed by LAWRENCE KEELEY at Oxford (see 1977a). Its accuracy has been supported by two sorts of tests: a blind test (KEELEY & NEWCOMER, 1977) and measurement of the light intensity of different kinds of polish (KEELEY, 1977b), and, further, by its duplication by other workers (papers given at conference on microwear, Sheffield, England, 1979). The method is sometimes called the high magnification method (e.g., SEITZER, 1978) even though it employs a whole range from about 30x to 560x.

Some microwear analysts have chosen to investigate the correlation between form and function with good reason, and the reason needs to be stated. Typological schemes for classifying artifacts (e.g., BORDES, 1961; DE SONNEVILLE BORDES & PERROT, 1954; TIXIER, 1963) are based upon the idea that changes in form reflect changes in technique. These changes in technique are the result of a cultural choice. The typology does not depend upon knowing the reason for the choice; technological investigation by experiment (see JOHNSON, 1978) has made it possible simply to define technological change. Artifact types are technological regularities which can recur in particular combinations. We can recognize artifact types primarily by retouch. BORDES lists four kinds: 1) 'the retouch of shaping', 2) 'the retouch of accommodation', 3) 'the retouch of utilization', and 4) 'retouch which corresponds to the stages of fabrication' (BORDES, 1969, 3-4). The last may mimic intentional retouch or use retouch in that both the blank and the placement of the retouch are the result of technological regularities. Because we must assume that repetition of form is intentional, the location of wear traces may also be repetitive. Blades with spontaneous retouch (see NEWCOMER, 1976) and cores belong in this category. Finally, an artifact type may have no readily visible retouch at all, but may be simply a recurring form of debitage, e.g., a Levallois flake.

The words 'style' and 'function' used in conjunction with typology are the usually undefined reasons that people have given to explain technological change. The word 'style' as employed by SACKETT (1977), JELINEK (1976) and CLOSE (1978) is a composite category which can be usefully subdivided for the sake of clear research aims and subsequent correlation of results. First, GLOVER and PRESLAND (in press) isolate 'heraldic function': it is the way which 'items of material culture may serve to identify the status, role, sex, age, clan, tribal, ethnic or political affiliation of the owner or user.' The elusive 'heraldic function' must be sought for its own sake and under its own special research conditions, for example, see HODDER (1977) and BINFORD (1977). Secondly, an attribution to 'style' has been the individual variation between craftsmen. This, too, has its own method, as GUNN (1975) has suggested.

Finally, the word 'style' has been used to refer to what is more accurately technological choice, for example, an instantly recognizable knapping technique, like Quina or Helwan retouch. It is the easy recognition of technological continuity which has led archaeologists beyond the confines of retouched pieces to investigate other debitage. PITTS (1978) has demonstrated technological similarity between assemblages by measurements of what used to be called waste flakes.

If the second and third categories of 'style' mentioned above are subsumed under the general heading of technological investigation, this has been true to an even greater extent for the word 'function'. The assumption that form follows function underlies most typologies, but we do not need to know the function in order to define the form. In BORDES' type list a particular kind of retouch on a particular blank does not depend upon function for its accuracy of definition. If technique is the main investigative procedure for the production of a typology, 'function' has been the explanatory device: recurring forms must surely be intentional. The early functional studies were sporadic and not altogether satisfactory. Perhaps the most successful kind of study was that undertaken by BORDES, who used artifacts from type lists which have functional names and found that they are often efficient tools as named (see BORDES, 1969). The definition of function which emerged is the (theoretical) relation between a working edge, defined by technology, a specific hand movement and a generalized worked material.

Microwear analysis is the systematic investigation of wear traces, and as such it can substantiate or disprove the theoretical aspects of the definition of function above. KEELEY and NEWCOMER (1977) define function by describing the location of the traces of use on the implement, the motion used by the hand and the specific material worked. The correlation between broad tool categories and function, shown by microwear, is high (KEELEY, 1978; MOSS, 1977; ODELI, 1978), implying that presumed function in the construction of typologies is substantially correct.

A consistent microwear method should reveal the consistencies and inconsistencies between function and type. This possibility does not in any way warrant the introduction of a separate functional typology. On the contrary, it is a means by which local and regional idiosyncracies may be defined. It is commonly assumed

Fig. 1 Antler polish on blade from Pont d'Ambon.



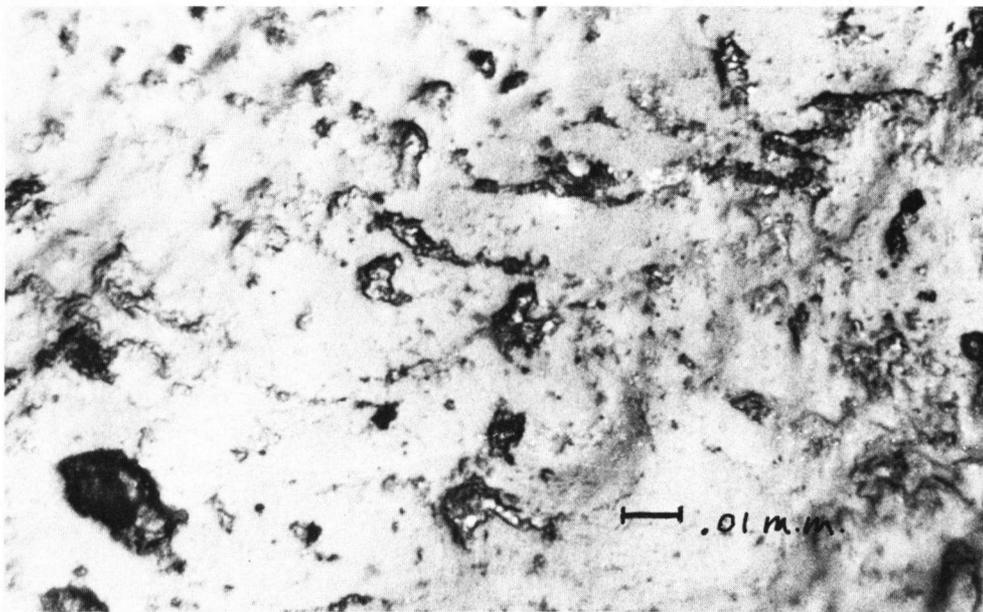


Fig. 3 An unpolished edge of the same burin as Fig. 2.

by microwear analysts that edge angle corresponds to function and to the hardness or softness of a material. A high edge angle, for example, 60° - 75° is supposedly best for working hard materials.

From the Azilian site of Pont d'Ambon (1) on the Dronne River in S.W. France there is a 10 cm. long blade with an edge angle of 15° at the distal end, which displayed a heavy concentration of antler polish (fig. 1). A possible explanation is that the blade was used for the final planing and polishing of an antler point. This particular blade was extracted for examination because it is an artifact type, a blade with the retouch and polish of use. The type/function combination may be anomalous, but it is possible to demonstrate whether or not it is and to show its spatial and temporal distribution on the site. The unusual combination of edge angle and worked material makes the example all the more compelling as a possible instance of technological behaviour which may have local or regional significance.

The ability to differentiate between polish types can obviously signal the former presence of organic materials on a site even if the organic remains have long disintegrated. Microwear analysis can also reveal the habitual use of certain materials for jobs. From the aceramic Neolithic levels of Tell Abu Hureyra, Syria (2), a sample of burins showed traces of silica gloss on the handles (fig. 2). The distribution of the polish was unlike that of sickle blades but indicated instead hafting by means of grasses or reeds. If the remains of basketry were not already present at the site (MORE, 1975), two other lines of enquiry would have produced a great deal of circumstantial evidence: 1) the wear traces showing systematic exploitation of reeds or grasses for technological reasons (hafting) and 2) cultivated einkorn in a morphologically wild state which must have been prolonged by the harvesting technique of beating the grains into containers (baskets?) (GORDON HILLMAN and NIEL ROBERTS, personal communication).

Microwear analysis continues technological investigation by experiment and observation. We must be able to recognize irregular forms which may once have been regular, even microscopically. One way of doing it is to distinguish between Bordes' four types of retouch, the retouch of post-depositional agencies and between the accompanying polishes. One can distinguish between a flake which was retouched prior to use and that which was retouched during use, between a core used as a scraper and one which was not. It has been recognized by several people independently that some burin types probably represent a resharpening sequence (NEWCOMER, personal communication). At Abu Hureyra burins on breaks, angle burins and axial dihedral burins (terminology of NEWCOMER, 1972) all have similar functions. KEELEY, too, found that at the Mesolithic site of Meer, Belgium, function cut across burin types (1978, 80). A sequence of events surrounding a tool from selection of raw material to post-excavation examination can be described, so that any parti-

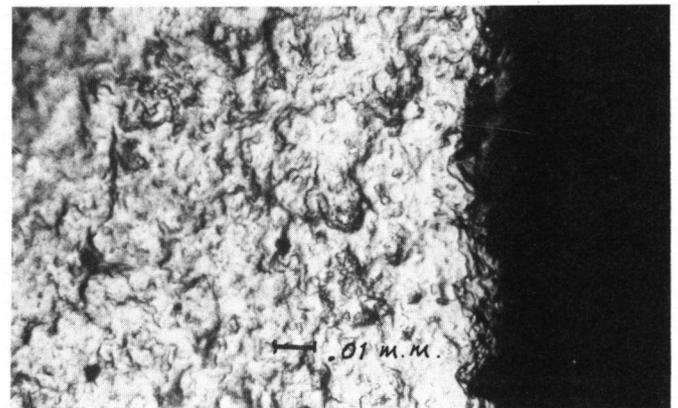


Fig. 2 Silica gloss on a burin from Abu Hureyra.

cular event which cuts through the technological sequence may itself become part of a new scheme of regularities. In the case of the burins, function remained the same through technological change and was, therefore, probably not its cause.

In conclusion I would say that the system for classification called typology ought to account for all visible technological change in stone artifacts, so that to say 'typology' will automatically mean technology in its various manifestations. The separation of typological change and technological change, for example, by AZOURY and HODSON (1973), implies that typology is charged with stylistic and functional meaning. If the expectations of typology and of microwear analysis are limited to be justifiable aims of reaping technological and functional information, they will be fulfilled. Those who expect a specific notion of 'style' to be revealed by those attributes which are neither technological nor functional will probably be disappointed. Style will have to be sought on its own terms and not under the guise of technology or function. A search for technological regularity justifies a sampling method which takes into account those forms which may not happen to be retouched tools but which should be examined microscopically because they recur. In this way areas which lack existing typologies, for example, parts of Australia, or the Ukraine, can nevertheless produce microwear samples which are soundly based upon technological features. Finally, the samples for the high magnification method, which is slow, may be smaller than those of the low magnification method, which is relatively faster. However, the number of usable pieces and the amount of information retrieved per piece are greater with the high magnification method (compare KAMMINGA, 1978 and ODELL, 1977 with KEELEY, 1977a and MOSS, 1977).

Other possibilities for the application of microwear analysis will emerge in time, but to proceed from an alliance with typology will enhance both avenues of research.

I would like to thank (1) Guy Celerier and (2) Andrew Moore for allowing me to examine material from their excavations.

REFERENCES

- AZOURY, I. AND F.R. HODSON, 1973 - 'Comparing Palaeolithic Assemblages: Ksar Akil, a case study', *World Archaeology*, 4, 292-306.
- BINFORD, L.R., 1977 - 'Forty-Seven Trips', in Wright, ed., *Stone Tools as Cultural Markers*, Canberra, 24-36.
- BORDES F., 1961 - *Typologie du Paléolithique Ancien et Moyen*, Bordeaux.
- BORDES F., 1967 - 'Considérations sur la typologie et les techniques dans le Paléolithique', *Quartär*, 18, 25-55.
- BORDES F., 1969 - 'Reflections on Typology and Techniques in the Palaeolithic', *Arctic Anthropology*, 6-1, 1-21.
- CLOSE, A.E. 1978 - 'The Identification of Style in Lithic Artefacts', *World Archaeology*, 10, 223-237.
- GLOVER, I. & G. PRESLAND, - in press, 'Microliths in Indonesian Flaked Stone Industries', paper presented to the Indo-Pacific Prehistory Assoc. Conference, Poona, 1978.
- GUNN, J., 1975 - 'Idiosyncratic Behavior in Chipping Style: Some Hypotheses and Preliminary Analyses', in Swanson, ed. *Lithic Technology: Making and Using Stone Tools*, The Hague, 36-61.
- HODDER, I., 1977 - 'Distribution of Material Culture Items in the Baringo District, Western Kenya', *Man*, 12, 239-269.
- JELINEK, A.J., 1976 - 'Form, Function and Style in Lithic Analysis', in Cleland, ed., *Cultural Change and Continuity*, New York, 19-33.
- JOHNSON, L.L., 1978 - 'A History of Flint-Knapping Experimentation, 1838-1976', *Current Anthropology*, 19 (2), 37-372.
- KAMMINGA, J., 1978 - 'Journey into the Microcosms', Ph. D. thesis, University of Sydney.
- KEELEY, L.H., 1977a - 'An Experimental Study of Microwear Traces on Selected British Palaeolithic Implements', D. Phil. thesis Oxford University.
- KEELEY, L.H., 1977b - 'The Functions of Paleolithic Flint Tools', *Scientific American*, 237 (5), 108-126.
- KEELEY, L.H., 1978 - 'Preliminary Microwear Analysis of the Meer Assemblage', in van Noten, et. al., *Les Chasseurs de Meer, Brugge*.
- KEELEY, L.H. & M.H. NEWCOMER, 1977 - 'Microwear Analysis of Experimental Flint Tools: a Test Case', *Journal of Archaeological Science*, 4(1), 29-62.
- MOORE, A.M.T., 1975 - 'The Excavation of Tell Abu Hureyra in Syria: A Preliminary Report', *Proceedings of the Prehistoric Society*, 41, 50-77.
- MOSS, E.H., 1977 - 'A Variation of a Method of Microwear Analysis Developed by L.H. Keeley, and Its Application to Flint Tools from Tell Abu Hureyra, Syria', M.A. dissertation, Univ. of London.
- NEWCOMER, M.H., 1972 - 'An Analysis of a Series of Burins from Ksar Akil (Lebanon)', Ph. D. thesis, Institute of Archaeology, University of London.
- NEWCOMER, M.H., 1976 - 'Spontaneous Retouch', in Engelen, ed., *Second International Symposium on Flint*, Staringa, 3, 62-64.
- ODELL, G.H., 1977 - 'The application of Microwear Analysis to the Lithic Component of an Entire Prehistoric Settlement: Methods, Problems and Functional Reconstructions', Ph.D. thesis, Harvard University.
- ODELL, G.H., 1978 - 'Préliminaires d'une analyse fonctionnelle des pointes microlithiques de Bergumermeer (Pays-Bas)', *Bulletin de la Société Préhistorique Française*, 75(2), 37-49.
- PITTS, M.W., 1978 - 'On the Shape of Waste Flakes as an Index of Technological Change in Lithic Industries', *Journal of Archaeological Science*, 5, 17-37.
- SACKETT, J.R., 1977, 'The Meaning of Style in Archaeology: A General Model', *American Antiquity*, 42(3), 369-380.
- SEITZER, D.J., 1978 - 'Form vs. Function: Microwear Analysis and its Application to Upper Paleolithic Burins', *Meddelanden fran Lunds Universitets Historiska Museum*, 5-20.
- SONNEVILLE BORDES, D. & J. PERROT, 1954 - 'Lexique typologique du Paléolithique supérieur', *Bulletin de la Société Préhistorique Française*, 51, 327-334.
- TIXIER, J., 1963 - *Typologie de l'Épipaléolithique du Maghreb*, *Memoires du Centre de Recherches Anthropologiques, Préhistoriques et Ethnographiques: Alger: II, Paris*.

Emily H. Moss
Institute of Archaeology
University of London