Technical Reports of the Australian Museum, Online (2011) No. 21: 1–244. ISSN 1835-4211
doi:10.3853/j.1835-4211.21.2011.1559

Experimental and Archaeological Studies of Use-wear and Residues on Obsidian Artefacts from Papua New Guinea

NINA KONONENKO

Anthropology Division, Australian Museum, 6 College Street, Sydney NSW 2010, Australia

ABSTRACT. The importance of microscopic examination and experimental replication techniques are being increasingly recognised in the field of functional analysis. The integrated use-wear/residue analytical techniques presented here focus particularly on understanding the processes of wear formation and the extent to which wear patterns on both ancient obsidian artefacts and experimental tools can be identified by microscopic techniques. The careful application of a wider range of techniques and a more precise methodology than had been employed in previous studies of obsidian implements increases the reliability of functional interpretations of prehistoric artefacts. A specific case study is presented to demonstrate the validity of the methodology developed. Methods of functional analysis were used to study obsidian assemblages dating to the middle and Late Holocene recovered from excavations at the FAO site on Garua Island, West New Britain, Papua New Guinea. The results of the research allow reconstructions of human behaviour over time to be substantiated or challenged.

The comprehensive set of colour microphotographs of identified wear patterns derived from an extensive experimental program are presented alongside images of archaeological tools which had been replicated by the experimental tools. The images represent a valuable resource providing researchers with useful tools for the analysis of obsidian artefacts derived from archaeological contexts in many other parts of the world. This research is intended as a reference tool for students and specialists, particularly those analysing artefacts made from obsidian.

KONONENKO, NINA, 2011. Experimental and archaeological studies of use-wear and residues on obsidian artefacts from Papua New Guinea. *Technical Reports of the Australian Museum, Online* 21: 1–244.

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Part 1 Introduction

A wide range of methodological approaches has been developed to study stone tool assemblages. Use-wear and residue analysis are among the most powerful techniques for reconstructing the ancient function of artefacts made from various materials including stone. This monograph contributes to that field of functional analysis which is based primarily on the observation of macroscopic and microscopic traces of wear and, to a lesser extent, of residual materials. It outlines the overall methodology adopted, including the replication experiments made, and describes the equipment and techniques utilised in the functional studies. The research is intended as a reference tool for students and specialists, particularly those analysing artefacts made from obsidian. Obsidian artefacts require special approaches since, as previous scholars have shown, their physical properties are somewhat different from flint artefacts and that methods devised for the study of flint tools are not necessarily relevant to obsidian assemblages (e.g., Aoyama, 1995; Hurcombe, 1992:24; Semenov, 1964:15). This research builds on previous studies, and particularly Hurcombe's (1992) seminal monograph, but it also introduces new approaches and presents an extensive range of reference materials thus enabling more precise results to be obtained. The study presents data on the wear patterns resulting from artefact use on a wider range of materials than has been previously published and with a particular focus on tools used in working with tropical plants.

The monograph has three main goals. The first is the further development of integrated use-wear/residue analytical techniques and replication experiments on obsidian tools with a particular focus on understanding the processes of wear formation and the extent to which wear patterns on ancient obsidian artefacts can be identified by microscopic techniques in spite of taphonomic factors. The research was undertaken with the expectation that the careful application of a wider range of techniques and a more precise methodology than had been employed in previous studies of obsidian implements (e.g., Aoyama, 1995; Fullagar, 1986, 1992, 1993b; Hurcombe, 1992; Kamminga, 1982; Lewenstein, 1981; Semenov, 1964) will increase the reliability of functional interpretations of prehistoric artefacts. To demonstrate the validity of the methodology developed, a specific case study is presented in which functional analysis is applied to obsidian assemblages dating to the middle and Late Holocene, recovered from excavations at the FAO site on Garua Island, West New Britain, Papua New Guinea (Fig. 1).

The second aim is to present a comprehensive set of colour microphotographs showing identified wear patterns derived from an extensive experimental program alongside photos of archaeological tools interpreted as being used for the same functions. The images available here comprise a considerable resource that will provide researchers with a tool for the analysis of obsidian artefacts derived from archaeological contexts in other geographical areas. Tool functions, wear formation processes which affect the tools during use and post-depositional taphonomic factors are all likely to be very similar throughout the world. Thus, even though many of the experiments were performed on tropical materials similar to those found around the site under investigation, researchers will find notable similarities with their own material.

The third aim of the study is to look at the investigation in a broader context. The Late Holocene, starting from about 3300 years ago, saw large-scale changes throughout the Western Pacific. On Garua Island itself, large stemmed tools were no longer made while Lapita pottery appeared in many sites (Torrence, 2002a). Elsewhere, domestic animals such as pig and chicken made an initial appearance, and there are widespread claims of extensive changes in language, biology and social structure. These changes have frequently been interpreted as marking the arrival of new settlers in the region (e.g., Green, 2003; Kirch, 1997:45–52; Spriggs, 1997:67–106). It might be expected that such sweeping changes would be accompanied by changes in the tool use strategy of people and the question of whether or not this was the case is discussed.