

**ARCHAEOLOGICAL FIELDWORK IN
WEST NEW BRITAIN, PNG
April-May 2005**

**Dr. Robin Torrence, Nina Kononenko,
Dr. Peter White**



Making a handle for an experimental obsidian axe

**The project is affiliated with the National Museum of Papua New
Guinea and the West New Britain Provincial Cultural Centre**

PARTICIPANTS

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Dr. Peter White, University of Sydney
Nina Kononenko, Australian National University
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ITINERARY

- April 24** Torrence, White and Kononenko travel to Kimbe, WNB.
April 25 Collect samples of plants and obsidian; begin experiments.
April 26 Meet with staff at the WNB Provincial Cultural Centre in Kimbe. Visit to Mahonia lumber yard to collect wood samples.
April 27 Use-wear experiments. Visit to Stettin Bay lumber yard to collect wood samples.
April 28 Use-wear experiments with assistance from Blaise Vatete and Mary Kimbe, WNB Provincial Cultural Centre.
April 29 Visit sites on Garua Island and collect obsidian from source.
April 30 Use-wear experiments. Knapping demonstration for tourists from Walindi Resort and local people. Meet with head teacher, Mrs. Lesley Lewis to plan visit to New Britain International School.
May 1 Use-wear experiments. Torrence presents talk on archaeological research in WNB at Walindi Resort.
May 2 Use-wear experiments.
May 3 Team talks to school children and presents knapping demonstration at New Britain International School. Children participate in use-wear experiments.
May 4 Visit sites on Numundo Plantation. Use-wear experiments with assistance from Mary Kimbe and other staff from the WNB Provincial Cultural Centre.
May 5 Trip to Bitokara Mission with Desmond Waluka from Gigo School to visit obsidian sources and archaeological sites. Discuss research with Mike Hoare, NBPOL.
May 6 Visit sites on Numundo and Kulu-Dagi plantations. Discuss results with staff at the WNB Provincial Cultural Centre. Use-wear experiments.
May 7 Finish use-wear experiments. Pack up.
May 8 Team travels to POM. Meetings with Nick Araho, National Museum, and Prof. Hugh Davies, University of PNG.
May 9 Meet with Jim Robbins, NRI. Meet with Siroi Eoe, Director, National Museum of Papua New Guinea and present seminar to staff at National Museum. Kononenko gives interview for Museum newsletter. Torrence presents lecture at the University of Papua New Guinea. Team meets with Chris McKee, Geophysical Observatory.
May 10 Team returns to Sydney.

SUMMARY

A number of well worked and highly distinctive obsidian artefacts known as ‘stemmed tools’ have been found in the Willaumez Peninsula. As part of an ongoing research project to find out how they were made and used, the team conducted a series of experiments to recreate West New Britain obsidian stone tools with traditional knapping techniques and to use them to make artefacts with local bush materials. The residues and use-wear produced on the experimental obsidian tools provide an invaluable guide for interpreting similar traces found on ancient chipped stone tools. The experimental results will be invaluable for archaeological research on obsidian tools from Papua New Guinea and other parts of the world.

The second aim of the trip was to acquaint Nina Kononenko, a PhD student at the Australian National University, with the general area since she is studying excavated stone tools from Garua Island for her dissertation research. The team therefore visited some sites previously investigated by the Australian Museum on Garua, Numundo and Kulu-Dagi plantations. Special trips were made to the prehistoric obsidian quarries at Bitokara Mission and Malaiol Stream, Garua Island to study the nature of the raw material and to collect material for the experimental programme.

Finally, the team discussed the ongoing research with staff at the West New Britain Provincial Cultural Centre, Mahonia Na Dari, and New Britain Palm Oil and gave talks to students and staff at the National Museum and University of PNG in Port Moresby, to school children at New Britain International School and at the Saturday program at Mahonia, and to the public at Walindi.

RESEARCH IN 2005

PROJECT OBJECTIVES

The major aim of the 2005 research in West New Britain was to conduct a programme of experiments that would help archaeologists reconstruct how stone tools had been made and used in the past. Although there have been several important studies of obsidian tool manufacture and use, such as those by Torrence (2003, 2004a, 1992), Rath and Torrence (2003), Pavlides (2004), Kealhofer *et al.* (1999), and Fullagar (1992), there is still a great deal to be learned. Fullagar conducted experiments using local materials during his fieldwork in 1988-9. Although these have been very important for archaeological research, they are very limited in the range of activities and plants used. We therefore needed to significantly extend the number of experiments, especially those using soft plants, and to make separate sets for research on residues and use-wear. In addition, a full photographic record of the experiments was planned. Our work follows the important studies by White (1968; White and Thomas 1972) and Sillitoe (1988) in which Papua New Guineans recreated tasks using stone tools, but in our case the actors had limited experience in using stone tools.

A more specific project objective was to evaluate ideas about the role of stemmed obsidian artefacts found in the Willaumez Peninsula in archaeological contexts dated between c. 10,000-3,500 years ago. Recent research on stemmed tools has concentrated on their spatial distribution, the source of the obsidian used to make them, and the manufacturing methods that might have been used (Araho *et al.* 2002 and refs cited within). Several scholars have noted that the larger varieties of stemmed tools are highly distinctive and would have required a great deal of care, skill and expertise in their manufacture. On this basis they have proposed that two specific categories of stemmed tools functioned as status items and as such demonstrate the existence of non-egalitarian societies in the Willaumez Peninsula at a very early date (Torrence 2003a; 2004; Rath and Torrence 2003; Araho *et al.* 2002). If correct, this would indicate the earliest evidence for complex societies in the Pacific region. In order to test this theory, we made experiments firstly to replicate the manufacturing techniques used to make the stemmed tools and secondly to create traces of wear and microscopic residues on them by re-creating a series of tasks (e.g. cutting, slicing, whittling a range of bush materials).

Obsidian and a range of bush materials were sourced from the local area. Next, Kononenko knapped a range of tool types. Then team members, assisted by local people and

school children, used the replicated tools in a wide range of tasks. A full photographic record was made of the experiments. These tools have been transported to Sydney where the use-wear and residues will be recorded using high power microscopy and digital photography.

STONE TOOL MANUFACTURE

Before coming to West New Britain the team worked with Kim Akerman, a skilled stone tool maker (knapper), to try out a series of methods for making stemmed tools. Although the work was somewhat limited by our small supply of obsidian, it was found that the production of the blanks for the stemmed tools ('kombewa') flakes required that one begin with quite a large nodule and that only excellent quality raw material could be used. Because the quality cannot be assessed just by looking at the outside of the nodule but requires flaking, a large supply of raw material is required. The type of blows that must have been used imply that a large, very dense hammerstone was used with a sharp blow but relatively soft force.

Once at Mahonia Kononenko began knapping experiments using cobbles previously obtained by Walindi to make a decorative stone wall. Although they were large enough for stemmed tools, many contained internal fractures because they had been previously partially worked or had been knocked about during transport. The team therefore made a trip to the Baki obsidian source on Garua Island and obtained fresh nodules. It was found that the quarried material was much less brittle and had superior flaking properties. Still, many pieces contain air bubbles and fractured layers that are only revealed through flaking. This work confirms that the production of stemmed tools required access to very high quality obsidian sources with abundant large nodules. Due to these requirements and the difficulty of finding cobbles that could be used for the largest stemmed tools, it seems most plausible that at least the initial stages of stemmed tool manufacture took place very close to the obsidian sources. It is unlikely that stemmed tools were made outside the area using imported raw material. In addition, testing of nodules and the production of blanks would have generated a large amount of waste, such is common at the prehistoric obsidian quarries in West New Britain.

During the project Kononenko replicated a number of medium and small stemmed tools for the experiments. She also made many simple flakes such as those found in many archaeological sites. Both these tool types were used in a variety of hafts for a range of tasks.

STONE TOOL EXPERIMENTS

Flakes, blades and stemmed tools were used in 213 use-wear experiments as summarised in Table 1. Two approaches were used. In the first an artefact was applied to one or perhaps several activities for a set amount of time: e.g. scraping for 15 minutes. All experiments were conducted for 5, 15, and 30 minutes and in rare cases up to an hour, so that changes in the development of the use-wear could be monitored. The main activities, cutting, sawing, scraping and whittling, were used on a wide range of raw materials. Additional actions including chiselling, chopping, piercing, shaving (Figure 1) and engraving (Figure 2) were also applied to a lesser extent. Plant rather than animal material and, in particular on soft plants, were primarily chosen since preliminary use-wear analyses by Fullagar (1992), Kealhofer *et al* (1999) and Kononenko have mostly observed traces related to these. Experiments on relevant animal products are easy to replicate in Sydney, but since obtaining abundant fresh bush materials is much more difficult, it was important to conduct the experiments in West New Britain.

Choice of raw materials for the experiments was based on several published ethnographic studies for New Britain as well as ethnobotanical studies made in Garu village by Lentfer, Kealhofer, and Therin (Lentfer 1995). Discussion with local villagers and staff at Mahonia, Walindi and the WNB Provincial Cultural Centre were also important in making plant choices. We attempted to source representatives from a range of botanical categories and from different qualities of the flora in terms of properties known to affect the nature of damage and polish on the edges of stone tools as a result of use: e.g. density, hardness, and presence of silica. In the cases where relevant plants were not available locally, we were able to acquire wood through lumber yards and various palms from NBPOL plantations.

The largest number of experiments (79) involved the use of leaves, fronds and stems of soft plants (banana, bamboo, ginger, croton, fern, ibeka, pandanus, sago, nipa and coconut palm). Taro was used in 10 experiments. Soft woods employed (49 cases) included hibiscus, erima, calophyllum and red cedar whereas hard woods (31) used were black palm, malas, taun, and casuarina. Other materials selected were bamboo, cane, rattan and coconut shell.

In the second, more 'lifelike' approach, obsidian tools were used to complete a particular task, which might require a number of different actions. For example, Bongi made a bamboo comb, bamboo fish spear, and did a carving using only obsidian tools (Figure 4). Although he has never used stone tools before, he is a skilled and knowledgeable craftsman and so his actions should be a good guide to those in the past. In another case several men shaved with

obsidian flakes, women prepared taros by roasting and scraping (Figure 2) and a set of designs were carved on soft wood or a coconut shell (Figure 3).

The experiments form an invaluable database that will be exploited by a wide range of scholars over a number of years. In the immediate future, Kononenko will compare the use-wear traces to prehistoric stone tools to assist her reconstructions. A special set of experiments will be reserved for the study of plant residues. These will enable scholars to study the type and distribution of plant fossils that might be preserved on ancient tools.

Although long-term studies are still in progress, a number of conclusions can already be made on the basis of the experiments. To begin with, it was clear that obsidian is most effective when used on soft materials. It is unlikely to have been used in activities requiring force, e.g. chopping, since the glass is too fragile. Although the edge is continually resharpened through fracturing, the tool breaks down relatively fast. The brittleness of the obsidian greatly limits the potential uses for prehistoric stemmed tools since the edges of those found in archaeological excavations are well preserved. This observation supports the theory that the large, very sharp tools were not used in everyday activities. Secondly, obsidian is ineffective in working hard wood. Despite its sharp edges, they dull very quickly and are easily broken when force is applied. Particular, distinctive scarring patterns were produced on the tool edges from working soft and hard woods and these can be used to identify this type of task on archaeological artefacts.

Finally, a number of experiments were conducted to replicate the kinds of handles that might have been used to hold obsidian tools (Figures 7 and 8). A range of bush materials including leaves, various kinds of string, and wood were trialed. It was found that due to their thickness and short length, it is unlikely that the small stemmed tools were hafted. We were unable to construct an effective wooden handle although a wide range of different types, binders, and glues were tried. In each case the handle became loose almost immediately. In contrast, wrapping tools with various types of softer material such as leaves provided a very effective handle. The different forms of handles used in the experiments should leave distinctive wear traces that can be used to find out what types were used in the past. Team members found the experiments were extremely useful in emphasising the strengths and weaknesses of obsidian tools for different tasks, especially in relation to alternatives such as shell or ground stone axes.

SITE VISITS

An important part of this year's trip to West New Britain was to introduce Kononenko to the local region in terms of general geography, climate and archaeological sites. Important trips were made to the prehistoric obsidian quarries on Garua Island and at Bitokara Mission (cf. Torrence 2002) where the team was also able to meet with the school teachers, and to important archaeological sites on Garua Island and Numundo and Kulu-Dagi Plantations. Kononenko was also able to visit the National Museum, see the exhibitions and discuss her research with the staff.

REPORTING AND CONSULTATION

The team met several times with staff at the WNB Provincial cultural centre to report on results of ongoing research and to discuss various matters concerning cultural heritage in the province. Staff members participated in use-wear experiments and assisted with visits to Bitokara Mission and Settin Bay wood yard. Torrence donated offprints of recent publications to the West New Britain Provincial Cultural Centre and other stakeholders including Mahonia Na Dari Library and New Britain Palm Oil, Ltd. A report to the Pacific Biological Foundation based on previous archaeological and geological research by the team (Torrence 2000; 2001; 2002) and which provides a volcanic hazard assessment of the Krummel-Garbuna-Welcker volcanic complex was presented to and discussed with several managers at New Britain Palm Oil, Ltd.

Kononenko gave demonstrations of stone tool manufacture to visitors and residents at Mahonia Na Dari and local community members. The team visited New Britain International School where they spoke to the children about volcanoes and archaeology; Kononenko demonstrated stone tool knapping (Figure 5); and the children participated in use-wear experiments using bush materials (Figure 6). Torrence gave a talk to students and teachers attending the Mahonia Saturday marine course and also a public talk at Walindi.

In Port Moresby the team met with Jim Robbins at the National Research Institute and with staff at the National Museum and gave a powerpoint demonstration about the research. At the request of Professor Hugh Davies, Torrence gave a seminar

to students and staff at the University of Papua New Guinea where the team also met with Linus digim'Rina (Senior Lecturer and Head of Anthropology and Sociology). Finally, the team also consulted with Chris McKee (Geophysical Observatory) about joint research in West New Britain.

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Figure 1 Blaise Vatete shaving with an unretouched obsidian blade.



Figure 2 Jessie and Lydia scraping taro with obsidian flakes.



Figure 3 Mary Kimbe carving a coconut shell with an obsidian flake.



Figure 4 Paul Bonggi with a bamboo spear and hafted stem tool made with obsidian flakes



Figure 5 Nina Kononenko knapping obsidian tools at New Britain International School



Figure 6 New Britain International school children cutting pandanus with obsidian tools.



Figure 7 Hafted stemmed tools showing different methods for hafting.



Figure 8 Using a stemmed obsidian tool to saw hard wood with a wrapped handle