In 1895, the Puketo Station assemblage of Māori artefacts was discovered in Otago, New Zealand. An interdisciplinary project aimed to preserve the information they contained. The project participants represented the disciplines of archaeology and museology (White), Māori weaving and culture (Te Kanawa: Ngāti Maniapoto, Waikato, Ngāti Tūwharetoa, Ngāti Raurua), and textile science and conservation of cultural material (Smith). A full description of all the Puketo artefacts and associated information lies outside the scope of this paper and is reported elsewhere (White, Smith, and Te Kanawa, submitted). Instead, one artefact, the *pukoro*, will provide a case study by illustrating aspects of the project and implications of these for maintenance of Māori cultural identity. Conservation treatment, plant material identification, examination of textile structure and collaboration, all uncovered important cultural information, ultimately adding to knowledge about pre-contact South Island Māori.

**INTRODUCTION**

In 1895, the Puketo Station assemblage of Māori artefacts was discovered in Otago, New Zealand. An interdisciplinary project aimed to preserve the information they contained. The project participants represented the disciplines of archaeology and museology (White), Māori weaving and culture (Te Kanawa: Ngāti Maniapoto, Waikato, Ngāti Tūwharetoa, Ngāti Raurua), and textile science and conservation of cultural material (Smith). A full description of all the Puketo artefacts and associated information lies outside the scope of this paper and is reported elsewhere (White, Smith, and Te Kanawa, submitted). Instead, one artefact, the *pukoro*, will provide a case study by illustrating aspects of the project and implications of these for maintenance of Māori cultural identity. Conservation treatment, plant material identification, examination of textile structure and collaboration, all uncovered important cultural information, ultimately adding to knowledge about pre-contact South Island Māori.

**BACKGROUND**

In 1895, a cache of predominantly textile and textile-related artefacts were found in a cave on Puketo Station, in Central Otago (Figure 1) (Hamilton 1896). With the exception of a few artefacts, the Puketo Station objects were accessioned by Otago Museum, Dunedin, in 1924 (White, Smith, and Te Kanawa, submitted).

The assemblage consisted of a large *kete* (bag) containing the other artefacts (Figure 2). These included smaller bags, strips of dog skin, ochre, unfinished weaving, a whitebait (*Galaxiids*) net, two pairs of sandals, and various weaving materials such as fibre from New Zealand flax (*Phormium tenax*). The assemblage was interpreted by Hamilton (1896) as the bag of a weaver, containing everything necessary to produce a high-status garment, such as a cloak. While some objects undoubtedly attest to the skill of an accomplished weaver, this group of artefacts also provides information about the economy and technology of pre-contact South Island Māori.

The *pukoro* (or tutu berry bag (D24.589), is a small finely woven bag, coloured a deep red (Figure 3). Māori informants from Puketeraki (Figure 1) had identified it as used to extract juice from tutu berries (*Coriaria spp.*)
The preservation of Māori textiles: collaboration, research and cultural meaning

As pre-contact South Island Māori subsisted largely on protein, the juice from tutu berries provided a highly desirable source of carbohydrate. However, tutu berry seeds were extremely poisonous. Juice was extracted safely by squeezing berries in tightly woven bags, the liquid passing though the weave, leaving poisonous seeds behind. At the time of discovery, however, the pukoro contained kokowai (ochre) (Hamilton 1986). Speculation about the purpose of the bag led to questions about whether colouration was the result of staining from tutu juice extraction, or from carrying ochre.

COLLABORATIVE RESEARCH: WHY IS IT IMPORTANT?

Māori are the indigenous people of Aotearoa New Zealand. European contact with New Zealand was first made in 1642 (Abel Tasman) and by the mid-19th century systematic European colonization had begun (King 2003). The Treaty of Waitangi (1840) between Māori and the British Crown established Māori as British subjects, and is considered the founding document of a bicultural New Zealand, with Māori and Pākehā (New Zealanders of British descent), the two founding cultures with equal rights (Tamarapa 1996). The interpretation and manifestations of biculturalism are manifold and varied, but include recognition of Te Reo Māori (Māori language) and bicultural service delivery by public institutions, like museums (Butts 2003).

Recognition of the Treaty of Waitangi, specifically Article II, acknowledges the particular relationship and responsibilities Māori have towards taonga, and that taonga have special intangible and spiritual values best understood by Māori. Taonga are ‘all dimensions of a tribal group’s estate, material and non-material’ (Kawharu 1989). All artefacts made by Māori, historic and contemporary, are taonga and embody important intangible aspects of Māori culture (Tapsell 1997).

They [taonga] are anchor points in our genealogies and in our history. Without them we have no position in society and we have no social reality. We form with them the social universe of Maoridom. We are the past and the present and together we face the future. (Mead 1985, 13, as cited in Hakiwai 1988).
Furthermore, neither taonga nor Māori cultures are static or unchangeable. Museum collections and presentations of taonga, oft-times as ethnographic evidence from the past, have been criticized for not recognizing the web of contemporary cultural meaning and relationships implicit in taonga (for example see Te Awekotuku 1988; Wood et al. 2003).

The clear implication is that Māori should be directly involved with taonga held in museum collections. The New Zealand Conservators of Cultural Material (NZCCM) code of ethics specifies that Māori have special knowledge of, and responsibility for, taonga, without providing prescriptive information about how to ensure involvement. Different processes of ensuring Māori participation are followed at every museum (for further discussion of consultation see Smith and Scott 2009). At Otago Museum, proposals for taonga are assessed by the Māori Advisory Committee, a group comprised of representatives from local runanga (tribal councils) (Smith and Winkelbauer 2006). In the case of this project, a highly acclaimed contemporary weaver, Kahutoi Te Kanawa, was also asked to be involved.

CONSERVATION TREATMENT

The conservation treatment of the pukoro, carried out some years prior, enabled examination for the interdisciplinary project. Prior to treatment the pukoro was in a parlous state and could not be handled (Figure 4). Plant materials were embrittled, and shedding from the artefact. The bag structure had collapsed obscuring areas of the kete, and horizontal lines provided evidence of folding, with associated loss. There were extensive areas of fabric loss along the sides and base of the bag. The kete handle appeared to be detached from one side of the bag.

In order to handle the bag, interventive conservation treatment was required. After surface cleaning, the pukoro was progressively re-humidified in a chamber, and its original shape re-instated by blocking using gradually larger Tyvek-covered pads of polyester batting. Fold lines were reduced by weighing down onto underlying supports with small polyethylene bags of lead shot. Eventually two appropriately coloured polyester-covered pads supported the structure of the kete. Rather than attempting to infill, toned Japanese tissue supports (Kizugishu) were adhered to the bag interior surrounding areas of loss (rice starch paste) preventing further shedding and supporting remaining plant material without attempting to breach the large gaps in the bag. Where starch paste was ineffective, plant materials were re-adhered to the tissue using 2%w/v methylcellulose (400cps) in distilled water. After conservation treatment, the pukoro had re-gained structural stability, and could be handled (Figure 3). Conservation treatment revealed important information about the bag. A stitched indigenous repair, previously obscured by fold lines, was now visible. The handle, previously thought to be damaged, had clearly only ever been attached at one side of the bag.
Achieving object stability meant examination of the *pukoro* for the current project was possible. In this way, interventive conservation treatment provided access to previously obscured Māori traditional knowledge, embodied in the plant materials used, and the textile construction of the bag.

**OBJECT ANALYSIS METHODS**

**Plant materials identification**

The identification of plant materials used was important for a number of reasons. Characterization of the materials from artefacts provides important cultural data about technological capabilities and enables appropriate documentation. Sometimes plant use is dictated by tradition, efficacy, or availability, in turn dependent on climate, trading partnerships and the ability to cultivate. Evidence of the valued nature of plants is also provided if they have been traded widely (Norton 1990).

However, the accurate identification of many plant materials, particularly when processed and aged, i.e., in the form they are found in artefacts, is extremely difficult. While all plant materials have physical and chemical characteristics that enable their identification, many have very similar features, particularly when relying on visual methods of identification. Natural diversity and climate variation will impact on properties displayed by any plant. Once processed and aged, these diagnostic characteristics, physical, structural and chemical, are also likely to be significantly altered (Carr, Cruthers, Smith et al. 2008).

Often viewing the surface of plant materials using microscopy or viewing transverse sections of them can aid in identification, if the particular characteristics of the plant are known. An online atlas of plant materials used to construct artefacts in the Pacific and New Zealand was developed providing reference images showing diagnostic features (physical characteristics, average fibre diameter, ultimate fibre length, etc.) to enable easier identification of plant materials (Carr, Cruthers, Girvan et al. 2008; http://www.otago.ac.nz/textiles/plantfibres/index.html). Cross-sections were made of samples from the Puketoi artefacts, and slides prepared for viewing to identify diagnostic features as displayed in the plant materials atlas. Otago Museum policy required that sample material could not be removed directly from artefacts. Instead, small pieces of plant material that had detached over time were used for identification. Exterior surfaces of samples were also viewed using scanning electron microscopy (SEM), and compared with reference material. Plant materials (surfaces, cut/broken ends) were also viewed and photographed in situ using an optical microscope. It is important to note, however, that reference images were of non-processed and non-aged samples of material. Current work is attempting to extend the atlas to include images of plant materials that have undergone common processing procedures, and images of samples derived from Māori artefacts.
Hamilton (1896) had stated thin pieces of ‘some leaf’ were the likely materials of construction for the pukoro, while Te Kanawa thought this was kiekie (*Freycinetia banksii*). Examination of samples using SEM (bonded dirt obscured leaf surface) and viewing cross-sections (no internal diagnostic features discernable) did not confirm that kiekie was present. Fortunately, kiekie has a distinctive horseshoe-shape in cross-section, which was clearly visible in in-situ micrographs (Figure 5). Microscopy also showed that the kiekie was heavily coated with a discrete layer of ochre, responsible for the red colouration of the bag, rather than tutu berry juice extraction.

Other New Zealand plant materials were also identified in the artefact assemblage in similar ways: New Zealand flax (*harakeke, Phormium tenax*), mountain daisy (*Celmisia viscosa*), and cabbage tree (*tī kōuka, Cordyline australis*). Most Māori artefacts held in cultural institutions are considered made from *harakeke*, despite ethnographic evidence indicating pre-contact Māori used numerous materials to construct textiles. Identification of a number of plant species present in the Puketoi Station textiles helped develop a more accurate and resonant picture of pre-contact textile tradition within New Zealand.

Moreover, the identification of plant materials showed exploitation of resources from far-flung geographic regions. In the case of the pukoro, kiekie is found a significant distance (Figure 1; at least 350–400 kms) from the find site. Kiekie can be harvested January to early March, or late August to October. Thus plant identification provides information about cultural boundary, possible trade relationships, societal complexity and resource procurement by pre-contact South Island Māori.

Identification of the plant material used also enabled Te Kanawa to elaborate on processing required to produce the materials to make the pukoro. Prior to weaving the preparation of kiekie is labour-intensive; leaves are stripped, boiled, and sun-dried to bleach the strips to an off-white colour.

**Artefact structure, form and function**

Technical analysis (weave diagrams, identification of structural features, and relationship to material choice), and ethnographic research together with ōkākā (traditional knowledge) were used to determine the possible function of the Puketoi Station artefacts. The ability to confirm the pukoro fulfilled its reported purpose was of particular interest.

The weave structure of the pukoro was extremely complex, with fine strips of kiekie (width 2 mm) worked in balanced 3/3 twill, identified by Te Kanawa as a horizontal weave called takirua (in pairs) and a vertical weave called whakatutu (standing up) (Figure 6). A weave diagram was also constructed by Smith to clarify the complex structure. At the mouth of the bag were two rows double-paired twine (*whatu-rua*) woven using fibre from *harakeke*. Another feature of the *kete* was a long plaited handle made from *harakeke* fibre, attached to only one side.
On the basis of examination of the bag, attempts were made to determine whether it was in fact a pukoro as indicated by Māori informants. Te Kanawa reported that kete for squeezing tutu berries (pū tutu) more commonly had a funnel shape. Extant examples of tutu berry kete at Auckland Museum were unlike the pukoro: not coloured, made of New Zealand flax, and all were cylindrical with long plaited handles extending from each end for twisting the bag (Clarke 2009).

Despite not being like other bags used for tutu berry juice extraction, the structure, materials and form of this kete do not preclude its use for the purpose. The structure would make the bag both flexible and capable of expansion with strength to withstand twisting. Kiekie was valued for its durability, strength and water resistance: a good choice for this purpose. The different weave structure at the mouth prevented the opening from stretching, and would act to retain the shape of the bag. The long handle could have been used to wind around the mouth to close it prior to squeezing. A long tear in the bag was meticulously repaired with plant fibre string. As the bag was discovered filled with ochre, it is possible that its use changed after damage (White, Smith, and Te Kanawa Submitted).

The pukoro is an example of rare and complex weaving, providing evidence of advanced adaptation to the plants of New Zealand, far-ranging exploitation of available resources, and sophisticated technological specialization. The intricate nature of the design and fineness of weaving strips used clearly represented the work of an accomplished weaver. While this is apparent to even the non-weaver, the exceptional quality of the work and knowledge implicit in the materials and weaving, required founder culture knowledge to be fully appreciated.

Te Kanawa reported that kiekie has strong fibre, stripped from the two sides of the spine of a single leaf blade. When fibre is removed from the blade, the remaining spine measures approximately 2 mm: the same width as the whenu (warp) of the pukoro. Many years of craft specialization are implicit in learning the tikanga, or cultural protocols, for harvesting and preparation of plant materials for such a kete, as the ‘finished product is dependent on the preparation of the materials’ (Te Kanawa 2006). To this end, the weaver works painstakingly to ensure regularity in size of plant material and pattern, using a haehae (measuring tool), or parts of the body (Te Kanawa 2006). The geometric patterns found in kete are memorized rather than drafted from a pattern, and relate to atua (the gods) and whenua (the land) creating a whakapapa (genealogy) for each kete:

These are the types of skills that are inherited through practice and working alongside tohunga kairaranga (experienced weavers). It is only through determination, commitment and hours of patience that an apprentice weaver gets to work alongside the tohunga kairaranga. (Te Kanawa 2006)

Te Kanawa found the intricate pattern of the pukoro and fineness of kiekie strips made replication of the bag extremely challenging (Figure 7). The
processing of the *kiekie* required was also time-consuming and difficult, and work required spiritual preparation:

I needed spiritual guidance and support, not being *manawhenua* (a person born of the area) I made sure to perform my own *karakia* (blessings) before commencing. This was in essence my own realization of respect and honour for the weaver who made the *pukoro*. (Te Kanawa 2010)

Through the creation of the ‘new’ *pukoro*, and weaving demonstrations given by Te Kanawa, this project has enabled rare and complex traditional methods of artefact construction to be communicated to contemporary communities.

**CONCLUSION**

Interdisciplinary examination of the Puketoi Station artefacts led to a number of important outcomes. In particular, examination of the *pukoro* shows how conservation and conservation-related activities (identification of plant materials, form and structure of artefacts) can provide important cultural information. Interventive conservation treatment of the *pukoro* made handling, and therefore examination, possible. Plant materials identification enhanced understanding of pre-contact economies in the South Island of New Zealand. Analysis of weave structure, form, and materials of the *pukoro* enabled a Māori weaver to replicate the bag, assisting in revival of past cultural practice. Additionally, this project explicates advantages of involving founder-culture practitioners in examination of cultural material held in museums, showing the enhanced depth of knowledge gained.

Without collaboration combining the knowledge and skills of traditional owners and contemporary techniques of analysis and conservation, information contained within this assemblage of artefacts would not have been accessible. In this way, the Puketoi Station interdisciplinary project made possible the preservation of aspects of Māori cultural identity. *Taonga* have ‘connections to people, places and times that can summon up the most passionate and intimate associations, the very substance of identity’ (Wood 2003, 85).

Through examination and replication of the *pukoro*, links have therefore been made between *taonga* and the living culture of the people who made it.

**ACKNOWLEDGEMENTS**

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ETHNOGRAPHIC COLLECTIONS

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1 Samples were fixed with Tellyesniczky’s formula, stained with haematoxylin ($C_{16}H_{14}O_6$) and eosin ($C_2OH_6BrNaO_5$), embedded in paraffin wax, and cut into transverse sections by an experienced histologist.

REFERENCES


CLARKE, C., Curator Maori, Auckland War Memorial Museum, personal communication, 12 September 2010.


TE KANAWA, K., personal communication, 12 October 2010.


**MATERIALS LIST**

Rice starch  
Conservation Supplies  
www.conservationsupplies.co.nz  

Japanese tissue (Kizugishu)  
G. Websters & Co. Ltd  
44 Manners St., Wellington, New Zealand  

Polyester batting, polyester fabric  
Spotlight StoresLtd  
www.spotlight.co.nz  

Methylcellulose (400 cps)  
Dow Chemical (NZ) Ltd  
www.dow.com