Gender, mobility and population history: exploring material culture distributions in the Upper Sepik and Central New Guinea

by

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…..These practices, then, and others which I will speak of later, were borrowed by the Greeks from Egypt. This is not the case, however, with the Greek custom of making images of Hermes with the phallus erect; it was the Athenians who took this from the Pelasgians, and from the Athenians the custom spread to the rest of Greece. For just at the time when the Athenians were assuming Hellenic nationality, the Pelasgians joined them, and thus first came to be regarded as Greeks. Anyone will know what I mean if he is familiar with the mysteries of the Cabiri-rites which the men of Samothrace learned from the Pelasgians, who lived in that island before they moved to Attica, and communicated the mysteries to the Athenians. This will show that the Athenians were the first Greeks to make statues of Hermes with the erect phallus, and that they learned the practice from the Pelasgians……

Herodotus c.430 BC

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<u>Abstract</u>

New Guinea is the most linguistically diverse region in the world. There are over 1000 languages found there, reflecting a complex history of migration and interaction. The Upper Sepik is one of New Guinea's most linguistically heterogeneous areas but because the area has not been marked by the significant population movement and intense and far-reaching exchange systems apparent for some parts of New Guinea, this diversity may be more indicative of processes that maintain rather than lead to linguistic diversity. Accordingly, the region may offer great potential for those investigating population histories.

With this potential in mind ethnographers went into the Upper Sepik during the 1960s and 1970s with the intention of making representative material culture collections for the language groups found there. These collections combine to be, arguably, one of the most fine-grained material culture datasets that exist for New Guinea.

This thesis describes the manner in which these collections were documented and used to create a dataset to test for relationships between material culture and language. It begins with an overview of the study area including descriptions of the geography, environments, subsistence systems, settlement structures and social patterns, including an appraisal of marriage exchange, ritual, trade and warfare and how these may have facilitated or inhibited the spread of culture. This appraisal leads to an assertion that the sociality and mobility of men and women are affected differentially by such mechanisms, and that material culture belonging to men and women may differentially reflect population histories and the social processes that underpin the evolution of linguistic diversity.

The thesis then describes a round of analytical procedures used to test for relationships between language and attributes belonging to string bags and arrows which are respectively and exclusively produced by women and men. Associations between languages, measured in terms of their material culture similarity, are then compared to those determined according to their linguistic family relationship and their relative positions in geographical space. The analysis also tests whether differences in the way that women and men socialise and move through space influence the way in which material culture patterns through space.

The thesis concludes that attributes of classes of material culture are distributed differently for objects made by men compared to those made by women, that distance seems to be a stronger factor than language, and that environmental factors are also relevant. This study foreshadows ongoing research involving the dataset.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968.

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Section One

1. Introduction

1.1 The Upper Sepik-Central New Guinea Project

Variation in material culture through time and over space has been used by archaeologists to infer discrete socio-cultural units and historical relationships between regional populations. However, there have been few attempts to quantify material culture variation between contiguous cultures in the ethnographic record. One of the reasons for this is that collectors on the whole have lacked the capacity, or motivation, to provide material culture samples that are simultaneously comprehensive in their content and regional in their coverage.

The Upper Sepik region of New Guinea is remarkable for its linguistic and cultural diversity and for the relative isolation of communities. Consequently, some anthropologists have concluded that patterns in the distribution of language elements and cultural forms may reveal historical relationships between many of the region's communities. Some of these researchers became alert to the potential of the region for such research purposes during field research in the 1960s and 1970s. This interest resulted in a number of large representative collections that are housed across several museums and private collections throughout the world including Australia.

The Upper Sepik-Central New Guinea Project (USCNGP)[1] is a multi-disciplinary project being undertaken by the South Australian Museum and the Department of Geographical and Environmental Studies of the University of Adelaide using a Geographical Information System (GIS) to quantify and explore relationships between material culture and the variables of distance, language, and environment in the Upper Sepik and Central New Guinea (USCNG) regions of Papua New Guinea. The role of socio-cultural interaction, facilitated by trade, warfare, marriage and ritual, is also being assessed.

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[1] A list of commonly used acronyms is provided in Appendix 1.

1.2 Lapita and the exploration of relationships between language and culture in Melanesia

One of the most important and enduring debates associated with the prehistory of Melanesia has concerned the migration of Austronesian speakers into the region. The geographical distribution of this family of languages ranges from Taiwan in the north to New Zealand in the south. Its east-west distribution is significant, spanning the area between Madagascar and Easter Island, and includes the Indonesian Archipelago, the Philippines and Polynesia. It is thought that the migrations resulting in this distribution began somewhere around 5500 Before Present (BP) and culminated in a final wave of migration from Melanesia into remote Oceania around 3200 BP (Bellwood 1991).

Evidence for retracing the origin and course of Austronesian dispersals has been sought initially through assessments of lexicostatistical relationships among the hundreds of Austronesian languages (Gray and Jordan 2000). This evidence has given rise to a number of models of Austronesian dispersal (Greenhill & Day 2005: 32-3). Three of the models have the Austronesian origin as Taiwan from which populations moved into South East Asia then east to Melanesia and Polynesia.[2] The only significant differences between these 'Out of Asia' models are the length of time in which the migration is assumed to have taken place and the number and intensity of migration episodes.[3]

The 'Entangled Bank' hypothesis provides an alternative model which proposes that present population and language distributions within Melanesia and Polynesia are best explained by demographic changes occurring within established populations in Melanesia inclusive of an intense network of interaction between Austronesian speakers and local populations across Melanesia and east South East Asia (see

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[2] What gave rise to the predominant theory that Austronesians have migrated from North Asia is that the languages outside Taiwan, within the subfamily of Malayo-Polynesian, are closely related while all other subfamilies are found on Taiwan indicating a greater ancestry for Austronesian there (see Greenhill & Day 2005, 37).

[3] The first of these was the 'Express Train' (Diamond 1988). Then there was the Voyaging Corridor Triple I model (VC Triple I). This model assumes five migration pulses with large pauses in between migrations. The second pulse, around 3200 BP, coincides with Lapita complex which is seen as a result of the Triple I process (Intrusion, Integration and Innovation) (see Green 2003); The other is the 'Slow Train' which includes the same sequence as the Express Train, but with greater pauses between pulses of migration.

Hurles et al. 2003; Terrell 1988; Terrell et al. 2001). This process had its origins in the initial human migration to the area as early as 40,000 BP (Golson 2005). It has been suggested this situation of intense interaction would have given rise to the kinds of seafaring and agricultural innovations that enabled populations to access and colonise remote Oceania.

Those who support the 'Out of Asia' models have proposed the Lapita complex (3200-2600 BP) as a cultural marker for the Austronesian migration eastwards across the north coast of New Guinea and into the Bismarck Archipelago. Elements of this complex include domesticates and agriculture: dogs, pigs, chickens and a distinctive adze technology, as well as the introduction of a new settlement pattern comprising clusters of stilt houses built over protected and shallow coastal waters (Gosden & Webb 1994; Spriggs 1993: 192). The most significant material characteristic of the complex, however, is a dentate-stamp decorated ceramic ware that has been found at archaeological sites almost entirely within Melanesia but including Fiji, Tonga and Samoa. Its most westerly occurrence is on the north coast of New Guinea.

The interpretation of Lapita as a marker for the migration of Austronesian peoples into Melanesia derives from a traditional archaeological viewpoint where abrupt occurrences of cultural phenomena in the temporal record are seen as best explained by the arrival of a new population (Jones 1997: 16-17). The lack of any pre-Austronesian ceramic precursor to the elaborate incipient Lapita ware, coupled with the co-occurrence of other parts of the complex, has been seen as evidence that it was brought into the area fully developed (Kennedy 1981; Gosden & Webb 1994; Kirch 1996). Uncertainty as to the function of the ceramic ware, its distinctive design and stylistic qualities as well as the tradition's relatively short span of less than five hundred years, has led to the proposition that it was an important socio-cultural marker for the colonising populations (Sand 1997, 4-6). It is assumed that there was a significant pause and consolidation in the Bismarck Archipelago during the colonisation process that gave rise to the emergence and florescence of a network of exchange and interaction, including a development of a localised Lapita culture, before population movement continued south-east to Vanuatu, New Caledonia and Fiji and eastwards into western Polynesia (Green 1991). Once Lapita

had been distributed as far as Fiji and Samoa, isolation and localised spheres of interaction resulted in a number of stylistic provinces and gradually the ornate design gave way to plainware (Anson 1986; Green 1978; Kirch 1990).

A contrasting theory supported by the proponents of the 'Entangled Bank' model sees Lapita as an innovation originating in the Bismarck Archipelago that diffused along overlapping spheres of interaction between existing and recent arrivals westwards along the north coast of New Guinea and south-eastwards to Vanuatu, New Caledonia and Fiji (Allen 1984). This was made possible by innovations in seafaring technology already taking place around the Bismarck group prior to the Austronesian arrival (Allen 1996; Egloff 1975). This model is also supported by some important archaeological facts: there has been no Lapita style pottery found in the supposed origin of Austronesian peoples in South East Asia; Lapita has been found only as far east as Samoa and Tonga within the Polynesian sphere; and both physical and decorative qualities of Lapita ware exhibit characters reflecting an inclination for locally sourced materials and techniques (Ambrose 1997; Chiu 2003; Galipaud 1988).

Nevertheless, it is possible that elements of the Lapita tradition may have derived from a number of sources and questions have arisen as to what kind of features of Lapita ceramic ware are pertinent to answering questions surrounding the arrival of Austronesian speakers (Green 1988). Most attention has been focussed on the dentate designs and their component elements but in reality there are a bewildering number of stylistic, technological and material elements that demonstrate considerable diversity throughout Melanesia. As Green (2003: 102) has recently argued, there is a need to

> sort elements of the Lapita Cultural Complex into separate piles as a
> strategic part of the approach to improving understanding of the various
> processes at work with respect to the history of each of the topics, traits,
> clusters or particular elements under discussion.

There have been some attempts to isolate particular material, morphological and technological elements of Lapita ware and track their distributions but these have been limited to narrow samples and there remains considerable work to assess the

range of styles, processes and techniques common to the tradition until an attribute considered a genetic marker is able to be postulated (Chiu 2003; Galipaud 1988; Summerhayes 2000).

1.3 The quantification of relationships between material culture and language on New Guinea's north coast

The Lapita puzzle has significant relevance to the questions that have preoccupied anthropologists and archaeologists concerning the emergence, spread and evolution of cultural packages and whether such packages can be used to identify populations who may share genes, languages and indeed common histories (Bellwood 1996; Terrell 2001a).

In an attempt to provide answers to such questions, a team at the Field Museum, Chicago, undertook an investigation of the relationships between material culture, language and distance along a 600 kilometre stretch of the north coast of New Guinea by using a dataset of over 6,000 items collected in the region by the ethnographer Albert B. Lewis between 1909 and 1913.[4] The environment of this region is relatively homogeneous and without a need to factor in the influence of a varying environment and geography, the relationship between material culture and language distribution is easier to explore.

The Field Museum team used the dataset to gauge the level of similarity/dissimilarity between assemblages from villages within the study area. Each object within an assemblage was classified according to its Functional/operational mode. This classification was seen as a method of indicating the presence of certain cultural practices that involved the use of those objects. Presence or absence of object classes was used to determine assemblage similarity or dissimilarity. Even though the assemblages used in their study largely consisted of objects collected by one person, they found marked differences in the number of objects and the number of classes of objects in the samples representing each language area. They found that the number of classes present at each village was closely related to sample size and accordingly constructed a measure of assemblage

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[4] Between Jayapura in Irian Jaya ([West] Papua) to Madang in Papua New Guinea (Welsch et al. 1992).

completeness by establishing the mean number of object classes present in each pair of assemblages (Welsch et al. 1992: 581).[5]

Welsch et al. (1992: 582) constructed a language matrix from existing assessments of the language relationships.[6] Geographical distance between each pairing of villages was measured and used as the counter variable to language in the analysis. Multiple and partial regressions were then carried out to measure the relationships between the variables. They found that sample size accounted for most of the similarity between assemblages; the rest demonstrated a greater relationship with distance than with language (Welsch et al. 1992: 583-88)

The Field Museum's study was seen by many as significant because it has brought to anthropology and archaeology:

> A model set of data that represents an era that is of historical importance and could not be duplicated today. Given the quality, complexity, and completeness of the data together with the theoretical relevance of the variables of propinquity, language, and material culture, it is certain to become a classic data set (Moore & Romney 1994: 370-71).

But the Field Museum's method has since come under criticism for two reasons: firstly, the study did not compare morphological differences between class members and by doing this the Field Museum study failed to acknowledge that objects that are considered functionally equivalent may vary in form. Therefore appropriately Peter Bellwood asked, in his Comment on Roberts, Moore and Romney's Current Anthropology paper (1995: 777):

> …what would the Welsch et al. analysis have shown had it been focussed not on gross functional categories of items but on fine-tuned stylistic variations (eg. in shape and decoration) within these categories? What would

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[5] They also used the Driver's G equation as one of four measures of similarity to account for missing data. Driver's G discounts similarity based on shared absences and this was seen as a way of eliminating a flaw in the measure created by poor collector sampling. They then constructed three subsets of assemblages containing 39, 47, and 54 classes respectively by discounting assemblages that had a 'very small number of objects as well as . . .a very small number of object classes' (Welsch et al. 1992, 571). The most important subset contained 47 and represented 31 villages.
[6] Wurm & Hattori (1981) for both Papuan and Austronesian, and Foley (1986) and Ross (1988) for Papuan and Austronesian respectively.

be the patterns with respect to linguistic differentiation if one were to extend this kind of analysis to the whole of Melanesia, including the New Guinea Highlands?

Functionally equivalent objects are often made with a range of different materials and techniques at different localities and these provide a better means of establishing cultural affinities. Indeed A. B. Lewis himself pointed this out after he had made the collection:

> [The design on string bags] and the character of the weave of the narrow band around the mouth of the bag, indicate the local place of origin. A native who is familiar with these styles can tell what village a bag came from by looking at it (cited in Welsch 1998: 119-120).

Secondly, another set of problems was present in their analytical approach. Because the study used only matrices of similarity and dissimilarity, they could not quantify the distribution of individual classes, the reliance on simple presence/absence data discounted analyses based on counts (Welsch et al. 1992, 581).

Soon after the Field Museum's analysis, anthropologists of the Department of Anthropology, University of California, Irvine, undertook a reanalysis of the Field Museum's data (Moore & Romney 1994; Roberts et al. 1995). Rather than using presence and absence to gauge similarity/dissimilarity, they used class frequency data in both log linear and correspondence analyses and found that language and distance equally accounted for the total variance in the data.

Recently, Stephen Shennan, and Mark Collard (2005), both of the University College London, used a range of multivariate analyses with which they have demonstrated a considerable difference between material culture packages, especially between Papuan and Austronesian language communities, in the Field Museum's dataset.[7] They carried out nearest-neighbour tests and established that Austronesian villages were more likely to be similar to each other regardless of propinquity. As Austronesians were relatively new arrivals it was presumed that a

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[7] Principal components and multiple regression analyses were carried out using logged artefact frequency data.

distinct phylogenetic signal may remain evident in the cultural set. Accordingly they undertook a cladistic analysis and demonstrated that branching (phylogenesis) accounted for fifty-four percent of variation as opposed to forty-three percent for blending (ethnogenesis) and that it was most marked in the Austronesian set.

Romney and Moore's, and Shennan and Collard's, analyses provided a better means to quantify and analyse the distribution of functional classes, yet they were unable to quantify the formal relationships between members of the same class.

1.4 Thesis objectives

The USCNGP seeks to further contribute to the debate surrounding Lapita's origins and other issues that have arisen from the Field Museum's study by using a dataset from an adjacent region. This thesis discusses the relevance of this new dataset to the study of relationships between language and material culture and provides a description of the way in which it was assembled, systemised and analysed.

The focus of the analyses are the two most important and complex functional classes within assemblages common to the study area. One class covers the range of arrows made by men and used by them for hunting and fighting. The other consists of the diverse range of string bags that are made by women but are essential in the daily and ritual lives of women and men. Importantly, each class of object has provided a range of technical and stylistic variability that is able to be codified and quantified in terms of distance and language.

The variables for these two classes are significant for two important reasons. Firstly, they provide a fine-grained measure of cultural similarity and dissimilarity between the communities of the study area. Secondly, as they are exclusively products of either gender their distributions are likely to reflect any differences that may exist between the genders' social patterns. If the social behaviour of the genders differ it may also be easier to discern more conservative patterns in culture from those associated with general patterns of interaction.

Much of the remaining content of the thesis involves the assessment of the study area's social systems and culture. Marriage exchange, trade and ritual patterns are

described and discussed in terms of their possible contribution in shaping both the content of social units and the broader cultural picture. What becomes apparent from the review of these mechanisms is that women and men are likely to have had different spheres of sociality and mobility at the time the data were collected.

The final section of the thesis focuses on the method used to create the material culture dataset and the analyses used to test this dataset for any significant relationships with language and distance. The first three chapters discuss theory behind the systemisation of material culture and in doing so provide a brief history of some archaeological approaches which are considered relevant to this exercise. The fourth chapter provides an outline of the method according to which a set of variables (attribute levels) was constructed to enable the encoding and comparison of technical and stylistic variation. The most crucial feature of the system, demonstrated in practice in the following section on method, is that the analytical units are values within dimensions that strictly conform to attribute levels inherent in technological hierarchies. This method avoids the use of typology, allowing values within attribute levels to be compared in isolation.

Finally, the last chapter describes the analyses involving the quantification of the dataset in terms of language attribution. This is followed by a discussion of the results including a comparison of findings for the two classes and an interpretation of the differences that are apparent.

2. Population histories and cultural units

2.1 Introduction

Since the establishment of anthropology as a discipline, two major imperatives have underpinned comparative studies. One has been the development of a means to determine socially and historically discrete populations, which has been seen as fundamental to the development of nomothetic principles concerning human adaptation and the development of social systems (Borgerhoff Mulder 2001). The second has concerned the development of a system to identify cultural affinities considered appropriate for making inferences about historical relationships between regional populations (Mace & Pagel 1994).

The first problem for researchers interested in determining cultural units appropriate for historical inferences is that they have to be relatively certain that shared attributes have common origins and are not the result of independent innovations. We see examples of these kinds of parallel developments in culture throughout the world; for example, the bow and arrow was commonly used in hunting and warfare throughout many continents during prehistory and in no way can migration or diffusion satisfactorily explain this global distribution (Boas 1932; Kirch & Green 1987; Lowie 1912; Service 1964). Even where there is continuity in the occurrence of such functional classes it still may not be possible to safely infer that diffusion or migration was responsible without other formal evidence (e.g. Leakey 1926).

The second problem facing such research objectives is that, as bifurcating populations become geographically and socially remote from each other, inhabit different environments and come into contact with other populations, there will be a number of factors that will obscure evidence of phylogenetic associations. Firstly, change in environment will lead to the relinquishment of particular practices and the adoption of others. Secondly, mechanisms such as drift will result in incremental changes in culture over time. And thirdly, humans have a great proclivity to learn and adopt new and extrinsic ideas and forms that will replace existing ones. This has been shown to extend to all realms of socio-cultural behaviour, meaning that most elements of culture can be passed between populations, even without movement of people or genes (Boas 1920; Evans-Pritchard 1940: 4; Wissler 1927; see Terrell 2001b for discussion).

Nevertheless, elements of language and culture most certainly vary in the degree to which they remain resilient to such things as innovation, imperfect replication, or redundancy and may also vary in the manner and ease with which they are able to be adopted (Barnett 1964; Durham 1990; Service 1964). This means that co-occurrence of particular kinds of cultural attributes may better reflect deeper historical relationships than more general cultural correspondences (Mace 2005).

While theories concerning the relative ease and degree to which cultural elements are able to be diffused have been proposed in linguistics, ethnology and archaeology, considerable uncertainty and controversy remains regarding the historical implications of cultural affinities (e.g. Bellwood 1996; Terrell 1988; 2001a). Admittedly, as far as the search for historical relationships between populations is concerned, there may be significant advances with the increasing sophistication in techniques to extract data from DNA; ultimately they should provide means to verify the appropriateness of using cultural attributes to identify historical relationships (Cavalli-Sforza et al. 1992; Cavalli-Sforza & Feldman 2003). For example, recent research involving the tracking of mitochondrial genome sequences has demonstrated a common origin for Papuan populations while also revealing a significant amount of genetic diversity due to geographic isolation and allopatry following bifurcation (Easteal et al. 2005; Main et al. 2001). The geographical picture for language more or less corresponds with this genetic pattern (Ross 2005: 42). Nevertheless, while the quantification of genetic variables will increasingly provide new data for use in such research, the practice of quantifying distributions of language and culture to speculate about population histories will remain an important tool, and in some instances a more appropriate tool, for tracking recent population histories (Borgerhoff Mulder 2001; Mace & Pagel 1994).

2.2 Cultural units and classification

The translation of socio-cultural phenomena into consistent units appropriate for comparative analyses has been an overriding concern across the social sciences (Weingart et al. 1997). This concern has been accompanied by a considerable debate concerning what it is that constitutes a coherent and most inclusive cultural entity and whether it is possible to articulate and systemise associated cultural

elements (Gatewood 2000; Naroll 1964). Sometimes contributions to these debates have been accompanied by theoretical frameworks that provide some basis for classification; sometimes the most compelling accommodate some principles of biological taxonomy (Lyman & O'Brien 2003). Nevertheless, no single notion of a cultural entity or unit has as yet been satisfactorily reconciled with that of any taxonomic category. Any stipulation of what determines a coherent and exclusive entity or unit, whether it be a language, a craft tradition, a myth, pot, a ritual act, or a type of house construction, would have to contend with the fact that these may be composites that include elements that not only have different lines of development and rates of mutability, and are drawn together through a range of different cultural and social processes (Boas 1904: 519; Kroeber 1931: 149; Gatewood 2000: 300).

To some extent it is possible that cultural units are able to be determined in terms of their relative position within a larger structure or configuration. For example, Weingart et al. (1997: 301) recently stated that units of culture may be conceived as 'component part[s]' that are essentially 'embedded' in a 'greater conceptual system'. In this they also echo early ideas concerning the interrelatedness of elements within larger cultural aggregates, 'complexes' or systems composed of related cultural activities (Linton 1936: 397; Murdock & White 1969: 329; 1927). Nevertheless, in recent times focus has shifted from what it is that constitutes such cultural aggregates, or what may be better termed as cultural systems, to the potential mechanisms that shape or determine the content and form of discrete cultural phenomena. For example, it has been argued that as cultural information is heritable, and commonly passed between generations like genes, units of culture are potential targets of natural selection (Boyd & Richerson 1985; Cavalli-Sforza 1986). Nonetheless, unlike genetic material, cultural units appear to vary considerably in the ease with which they are able to be transmitted and their transmission may also be directed or constrained by a range of isolating mechanisms, culturally determined biases or cultural-selective processes (Durham 1990; 1992; Durham et al. 1997). It is therefore possible that a better understanding of how these factors shape cultural content may provide a means of determining the makeup of cultural entities and by extension could determine the scale and types of units with which to form a systematics (O'Brien and Lyman 2003; Tschauner 1994; Weingart et al. 1997: 301).

2.3 Cultural patterning and transmission

All aspects of culture, material or otherwise, are reliant on transmission if they are to be shared and therefore both the temporal and spatial frequencies of a cultural attribute will somehow be determined by transmission processes. Recently, there has been a renewed focus on transmission processes in the social sciences, especially in archaeology where the effects of transmission through time can be measured through patterns in attribute frequencies (O'Brien & Lyman 2003a). Exponents have adopted an evolutionary approach to help explicate such patterning. The paradigm has it that a population may be seen as having at any given time a certain amount of cultural attributes and that these will provide the population with a given level of adaptedness or fitness to current and future environments (O'Brien and Holland 1992). While some attributes may become adaptations according to their 'consequences on [their] bearer's fitness in past environments' (Borgerhoff Mulder et al. 1997: 268), at any given time attributes within a population's cultural assemblages will have different relationships to selective pressures. O'Brien and Holland (1992: 46) have proposed three attribute categories according to relative sensitivity to selective forces:

(1) Attributes that are under selective control that increase adaptedness;

(2) Traits that are not under selective control but nevertheless increase adaptedness;

(3) Traits that are not under selective control and that do not increase adaptedness.

All attributes would therefore initially belong to category 2 and 3 but some in category 2 may eventually end up as belonging to category 1. In the diachronic record it has been suggested that attributes belonging to category 1 should maintain a fixed frequency through time until they cease contributing to adaptedness and drop from use (Dunnell 1978: 199). Category 2 attributes are those that are known to a population but they are alternatives to existing adaptations so their incidence in the material record would be sporadic and random.[8] Attributes belonging to category 3 being free of selective pressures will exhibit frequencies that are purely

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[8] O'Brien & Holland (1992: 51) provide an example in the occurrence of shell temper in pottery vessels made by a prehistoric population in midwestern United States. Prior to the time shell temper became a preferred medium due to adjustments in kiln technology it had been a stop gap alternative to other mineral tempers.

the product of transmission episodes (Neiman 1995; O'Brien & Holland 1992: 49). Because of the lack of selective pressure, variants will arise through innovation or errors in replication. These will enter the social milieu through social intercourse and will be exchanged between individuals. All being equal, probability will determine whether a new variant is adopted and replaces an existing variant (Neiman 1995: 10). Without new variants this will result in a reduction of variation and increased homogenisation (Neiman 1995: 12). Such a process, commonly termed drift, has been argued to affect the frequencies of cultural attributes in much the same way as drift is seen to determine frequencies of non-functional alleles in the gene pools of biological populations (Bettinger et al. 2003: 41-43).

As for genetic variation, demographic size also affects a population's capacity to retain cultural variants. Groups with decreasing populations will no longer be able to maintain as large a degree of variation and this will result in an increase in the rate in which variation is reduced. Also, when populations are small, as with genetic drift there will be fewer 'mutations' (innovation, introduction or errors in replication) providing new variants — nevertheless small populations are more likely to adopt new variants from other groups due to the lack of normative control typical of larger populations (Boyd & Richerson 1985: 9). Therefore, if the two parts of a bifurcated population remain large they will more likely retain cultural affinities for a longer period (sum total of similarity), especially if there are no selective pressures coming into play in either population (see Neiman 1995: 10).

The extent to which drift shapes cultural packages has been discussed for some time and the unimodal distributions in ceramic and stone tool diachronic seriations are largely seen as products of its effect (see Neiman 1995: 12). In terms of spatial distributions it has been pointed out that drift results in either a pattern of co-variation between formal attributes belonging to functional equivalents in two isolated but historically related populations; or auto-correlated distributions in larger regional populations resulting in more reticulated patterns of distribution (Binford 1963: 93; Lipo et al. 1997).

Aside from contending with the problem of detecting homologies between groups where the process of drift has resulted in differences between the cultural packages

of two related but diverged populations, diffusion will contribute to the effect of drift and further mask and erode the phylogenetic relationships between them by introducing new variants to populations. If interaction between two historically distinct populations becomes significant, the process of drift will then similarly affect the frequencies of cultural attributes in the two populations and they will start to develop homogeneity in their relative frequencies of formal variants. Therefore, one must be aware that there are two important effects of drift for spatial distributions of culture attributes: one, it could conceivably erode evidence for phylogenetic relationships between two related but spatially isolated populations; and two, it could mask phylogenetic difference between two populations where interaction between them is strong. A combination of the process of diffusion and drift has been argued to be responsible for much regional-level patterning of culture, especially that observed in the ethnographic record when populations were becoming increasingly fluid through the effects of colonisation (Collard & Tehrani 2005; Moore 1994a; 1994b; 2001; Terrell, Hunt & Gosden 1997 but see Collard et al. 2006).

2.4 Cultural biases and cultural selection

Some researchers have questioned whether natural selection and the stochastic processes of sorting associated with transmission can sufficiently explain spatial and temporal patterning of culture. As was discussed above, it has been suggested that there may be a number of socio-cultural processes acting at group and individual levels that somehow regulate cultural evolution (Bentley & Shennan 2003; Borgerhoff Mulder et al. 1997: 266; Bettinger et al. 2003: 44; Shennan & Wilkinson 2001).

Firstly, cultural transmission involves a number of avenues for social learning, each of which requires differences in the modes of conveyance. Those that are inter-generational, most especially between parent and child, can be seen as part of a greater system of dual inheritance that includes genes (Boyd & Richerson 1985). These require specific conditions and may involve a number of culturally-imposed regulatory mechanisms (Arnold 1985: 234; Weingart et al. 1997: 317-325). Therefore culture attributes whose templates demonstrate a strong propensity to be passed via inter-generational transmission and be regulated by such mechanisms,

will display some fidelity and stability through time (Cavalli-Sforza & Feldman 1981: 353). In a synchronic sample such attributes may have distributions corresponding to close social ties and if a population had recently bifurcated, it is these that will be likely to remain intact for longer in each resulting population's cultural package.

Secondly, there may be a number of transmission isolating mechanisms (TRIMS) that prevent the spread of culture from group to group (Durham 1992). Some of these may be due to environmental, geographical and even 'psychological' factors inhibiting diffusion but some will involve more discreet cultural-selective processes working within a population (Cavalli-Sforza & Feldman 1981: 63; Durham 1992: 333-34). These ensure a degree of continuity and coherence for culture and as a consequence would tend to maintain difference between populations, even where there was some degree of interaction between them. At least some of the culturally based TRIMS may be argued to be in the form of biases that impact on individual choices (Boyd & Richerson 1987; Henrich & Boyd 1998). In an evolutionary framework such biases can be seen to function in a similar way to reproductive isolating mechanisms (RIMS) that restrict gene flow between biological species to ensure the prevention of maladaptive gene variants entering a population (Durham 1992: 333). The reasons behind such biases are therefore similar to that proposed for RIMS: natural selection will favour a degree of conformity in human populations which guides individuals to adopt tried-and-true practices rather than to develop new practices (individual learning) — a strategy that tends to be more time consuming and susceptible to error (Boyd & Richerson 1985: 10). Therefore people will demonstrate a tendency to learn from someone they consider similar to themselves — such as a family member — or adopt the cultural practices that prevail in the community, especially those associated with individuals considered as successful (Boyd & Richerson 1987: 69). By default this will suppress the inclination to adopt exotic practices which may have been developed in dissimilar environments and therefore may also be maladaptive in the immediate environment (Henrich & Boyd 1998). It is easy therefore to envision how this would not only lead to culture difference between groups, regardless of whether environmental differences exist, but would affect sorting processes associated with drift.

One other important paradigm increasingly used to explain the origin of regulatory mechanisms that maintain cultural coherence has been founded on the principal that many behaviours associated with a range of related activities, one could argue as comprising a single cultural system, are necessarily internalised and organised into operational sequences (*chaîne opératoires*) (e.g. Lemonnier 1992: 25 ff). These are seen to be not intentionally directed by society but rather enforced by predispositions that have resulted from shared social experiences, what has commonly been termed as *habitus*. Pierre Bourdieu (1990: 54), who introduced the concept of *habitus* to social theory, once explained it as

> …..produc[ing] individual and collective practices…..in accordance with the schemes generated by history. It ensures the active presence of past experiences, which, deposited in each organism in the form of schemes of perception, thought and action tend to guarantee the 'correctness' of practices and their constancy over time, more reliably than all formal rules and explicit norms.

Accordingly, it can be argued that history through the agency of *habitus* both directs and constrains individual and group practice and this will be reflected in the content of cultural assemblages. So, while it can be argued that cultural assemblages are necessarily geared to the overall survival and reproductive success of a society (e.g. Gibson 1999: 362), such a theory goes one step further by shedding light on the possible psychological and cognitive foundations of cultural biases posited in evolutionary models (Lemonnier 1993b; Stark 1998b: 5).

What sort of patterns could we expect to find in cultural packages that would reveal the relative effects of mechanisms such as those described above, which determine the uptake, retention and loss of cultural elements. At the most inclusive scale, Boyd et al. (1997: 365-66) have offered four hypothetical models for the manner in which cultures are variously configured according to the relative weight of such mechanisms and they suggest four patterns of cultural coherence. One extreme is where cultures may be conceived of as 'species' in that they are independent, exclusionary and inhering entities. Under such circumstances, diffusionary processes would have little effect because constituent units are inter-dependent and resistant to acquired variants (Borgerhoff Mulder et al. 1997: 266). Change occurs

only after bifurcation whereby evolutionary processes act differentially on the two populations. At the opposite end of the scale, a cultural 'entity' would be a cluster of largely autonomous, interchangeable and volatile culture units.

Between these two extremes, Boyd et al. (1997: 365) have positioned two models. The first model involves a system that is somewhat more open than the species model and defined as 'hierarchically integrated' with 'core traditions' and peripheries consisting of more ephemeral units:

> Although cross-cultural borrowing may be frequent for many peripheral components, a conservative 'core tradition' in each culture is rarely affected by diffusion from other groups . . . Isolation and integration protect the core from the effects of diffusion.

The second model has a culture as an assemblage composed of 'many coherent units' or 'domains' that may have 'different patterns of inheritance and different evolutionary histories'.

While all models are possible, the two intermediate models have been accepted as defining the most likely structures of cultural packages. This is because social units are never seen as being wholly exclusionary or ephemeral and that such models acknowledge the possible effects of all processes described above (e.g. Holden & Shennan 2005: 16). In the first of these models, the majority of cultural content is directed by biases and cultural-selective mechanisms and hence the systems contain large coherent cores. In the second, on the other hand, constraints and biases are weak and consequently the greater content of cultural packages is shaped by interaction and drift.

I envision that most culture assemblages, and indeed individual artefacts, can be considered as being somewhat hierarchically integrated. They will consist of cores of relatively immutable units that are transmitted according to specific social contexts, regulated by cultural biases, and demonstrate a strong interrelationship with other units in the system. The extent to which biases and cultural-selective processes provide a core for a cultural system may vary according to the complexity of the system and the underlying demographic structures of the society that rely on

such systems (Binford 1965: 220). These core 'traditions' may not only be seen by their owners as vital elements of culture; they may ultimately determine the structure into which the more ephemeral components are positioned. Ephemeral components of cultural assemblages, on the other hand, may be choices within a range of possible alternatives. Consequently they may be considered quite unimportant to a cultural or technical process and easy to replace.

2.5 Discussion

It is conceivable that biases or predispositions and other cultural-selective TRIMS, coupled with the fact that many elements of culture require intensive modes of conveyance, may result in cultural systems having core traditions, ones that share a strikingly close relationship with human phylogenies. The arguments are compelling, but it remains to be seen to what extent they account for nuances in cultural distributions. If there are important regulatory mechanisms that impact on cultural choices, there would necessarily be abrupt discontinuities of cultural attributes even where interaction between groups is strong. However, significant discontinuities across a broad range of culture attributes are usually not very apparent in ethnographic examples, reflecting the likelihood that such mechanisms have an unequal effect on cultural phenomena (Hodder 1982: 18ff).

What must also be considered is that such mechanisms are likely to work differently for the social classes within any socio-cultural unit. For example, a community's male and female populations would have different social fields within which the modes of conveyance and the relative strength of such biases may differ. It may be possible therefore that where a social cohort's social sphere is smaller they may have a material culture assemblage with an attribute structure more regulated by TRIMS and other such constraints and are consequently more 'hierarchically integrated'. On the other hand, a social cohort with the greater social field will tend to have an assemblage that comprises 'many coherent units'.

While material cultural datasets offer the potential to explore such questions what the above discussion has made clear is that this will require cultural units germane to such an undertaking. The elucidation and extraction of such units, at least those

deemed appropriate for such an exercise involving the USCNG study area will be demonstrated in Section 5.

Section Two

3. The geography and environment of the study region

3.1 Introduction

The USCNG area can be defined as the region intersected by the course of the Sepik and its tributaries upstream from its confluence with the May River, including the highlands region at the source of the Sepik, Fly and Digul rivers. The Bewani Mountains form the northern limit (thus precluding the north coastal zone of West Sepik Province) and the southern slopes of the highlands of Central New Guinea (CNG) define the southern limit (See maps, Appendices 2 and 3, and photos, Appendix 7a).

Through this region the Sepik River flows for the first third of its 1100 kilometre course. From the river's catchment in the highlands of CNG, the Sepik first follows a northwest course through the mountains. Then it takes a more northerly course, flowing into and out of the Indonesian province of [West] Papua, east around the northern end of the West Range until it is joined by the May River, then meanders east until it reaches the Bismarck Sea.

The study area can be subdivided into three environmental zones: a dramatic mountainous zone consisting of around 13,000 square kilometres (CNG), a lowland zone immediately to the north that encompasses over 6,000 square kilometres (the Upper Sepik Basin), and a hilly zone to the northwest of around 1,200 square kilometres (the Border Mountains).

3.2 Central New Guinea

The highlands of CNG are essentially a cordillera running east-west with an apex that follows the Western Province and West Sepik Province border (Appendices 7d and 7e). The Star Mountains form the highest range in the system, reaching an altitude of around 4000 metres and dominate the western end of the highlands, continuing on into Indonesia where they cover approximately 2,600 square kilometres of [West] Papua (Brongersma and Venema 1962).

This geologically diverse and rugged region is characterized by limestone karst formations with massive escarpments along the southern edge (Gillieson & Hope 1990: 28; Reynders 1962: 46). The slopes of the central range are serrated and

complex, consisting of sedimentary rock which is unstable and prone to slippage due to the heavy rainfall (Hyndman 1979: 59; Hyndman & Menzies 1990; Morren 1986: 67). Valleys are often narrow with steep walls but the terrain between small streams and rivers at the lower ends of the valleys provide relatively flat tracts of land. Along the centre of the highlands is a series of broad inter-montane valleys between 1,450 and 1,800 metres Above Sea Level (ASL), forming the source basins for the Strickland, Sepik and Digul Rivers.

Hyndman and Menzies (1990) have identified three zones of forest for CNG. The foothills north and south of the highlands (100 to 500 metres), and the West Range, provide stands of sago palms in the valley floors and tropical forest of mixed composition on the slopes and ridges, including trees that belong to the beech, myrtle and mahogany families. These occur with canopies of up to 50 metres high (Hyndman 1979: 79; Hyndman & Menzies 1990: 245).

The mid-altitude zone (500 to 1,500 metres), south and north of the central range, is rich in wild plant resources and various animals, but cloud and excessive rain restrict the success of tuber crops such as taro and sweet potato (Gillieson & Hope 1990: 29-30; Hyndman 1979: 61, 78ff; Hyndman & Menzies 1990: 244; Hyndman & Morren 1990: 16-18; Morren 1986: 68-71).

In the highlands (above 1,500 metres), conifers become increasingly common and above 3000 metres cloud forest and alpine tundra dominate. These are generally poorer in plant resources but the former supports a greater diversity of marsupials desirable as prey (Morren 1986: 71). The inter-montane valleys, located around 1500 metres, provide relatively stable micro-climates; within them are situated primary and secondary stands of temperate rain forest on the surrounding slopes. Considerable tracts of cane and kunai grass (*Miscanthus sp.* and *Imperata sp.*) caused by centuries of sustained shifting agriculture, cover much of the valley floors (Gillieson & Hope 1990: 29).

In CNG, most people live between 1,250 and 1,800 metres ASL with the densely populated areas within the inter-montane valleys. These broad and open valleys have the lowest precipitation of the highland region, as well as better exposure to

sunlight, and provide the best environment for intensive swidden agriculture (Cranstone 1990: 35-36).

3.3 Border Mountains

The topography of the Border Mountains, like that of the slopes and foothills of CNG, is complex (Appendix 7c, Gell 1975: 8-9; Huber 1979; Peter 1990: 245). From swampy forests at around 50 metres ASL, thirty kilometres east of the border with Indonesia, they rise to a maximum of just under 1,000 metres ASL and stretch fifty kilometres north to south. Huber's (1979: 131) description of Anggor territory on the eastern flank of the mountains provides a vivid and accurate picture for the region

> …..the terrain is steep and irregular. It consists of an intricate dendritic drainage pattern of small, even miniscule watercourses. These are separated by steep narrow ridges, forming an outline that articulates and complements the stream pattern. In any locality the overall altitude gradient is obscured or distorted by small, prominent mountains and by the myriad oblique intersections of streams and ridge crests. The ridge crests are narrow, five to ten meters, and the hillsides are commonly in excess of thirty degrees in slope.

Much of the Border Mountains is composed of limestone outcrops with valley floors and hollows composed of fine sedimentary clays. The lowest ground is intermittently swampy with stands of sago palms. Dense primary and secondary forest dominates the rest of the terrain and there are no significant grasslands. Most settlements are located on ridges between 300 and 500 metres ASL.

3.4 Upper Sepik Basin

In contrast to the highlands of CNG and the Border Mountains, the Upper Sepik Basin (USB) is a relatively featureless alluvial plain situated between 50 and 100 metres ASL with a few isolated hills exceeding 200 metres ASL (Appendices 7b and 7c). The Basin is drained by several tributaries of the Sepik and large tracts are flooded in the wet season (November to April).

There are two environments in the Basin. The first is to be found around the Green River and Yellow River settlements at the south-west and south-east corners of the Basin. It consists of lightly timbered swamps that are recharged by flooding in the wet season and extensive stands of sago palms and swamp grasses (*Saccharum sp.* and *Phragmites sp.*) along the river banks. The second zone consists of mature or secondary rainforests with a diversity of plant species and trees (Hyndman & Menzies 1990: 245; Morren 1986: 68, see also Reiner and Robbins 1964: 32 for possible composition).

Three subdivision of forest have been identified by Reiner and Robbins (1964: 32-33) for the lowland hills and plains of the middle Sepik to the east and, from descriptions found in several ethnographies, the forest *structure* of the USB is similar to their observations. Flood plain forest is rather low with a canopy at around twenty metres and is dominated by a variety of palm species. Alluvial forest beyond the flood zone has three strata with canopies reaching up to fifty metres and including species of trees found similarly in hills environments. Two major stands of anthropogenic grassland comprising rhizomatous grasses (*Imperata sp.* and *Themeda sp.*) are located away from the major riparian flood zones near the Green River and Yellow River stations (Allen 1983; Reiner & Robbins 1964: 29; Kelm & Kelm 1980: 3-10).

Probably the most variable terrain and environment on the plain, for which Thurnwald (1914: 5-6 – translated by Harry Beran) provides an excellent description, is on and near the banks of the Sepik and a few other major rivers:

> The banks are similar all along the upper course of the main river: steep and wooded on the outside of the curves, while on the inside, sandbank or wild sugar cane and behind, young forest with numerous wild breadfruit trees. One frequently comes across signs of alterations in the river's course—new breaches and devastated woods, the mouths of old streams, and lagoons.

Because much of the Basin lacks the environmental diversity found in the hills and mountains, people took advantage of transitional zones where river, forest and swamp resources could be accessed relatively easily. Therefore large tracts of swamp were left relatively unpopulated.

4. Regional subsistence patterns

4.1 Introduction

In this chapter and following sections concerning settlement and social variables descriptions and assessments are made in terms of the situation that would be most likely to have existed at the time when the balk of the collections were made, i.e. 1960s and 1970s. In some instances the present tense is used for there is no indication that circumstances or conditions have changed on the ground. In other cases the past tense is used because there is a likelihood or evidence that change has taken place since contact with colonial authorities. Therefore readers are encouraged to consider that when present and past tense are used the relevant text refers to same period.

Subsistence systems found in the Border Mountains, USB and CNG have basic similarities and dissimilarities. The most significant similarity is that all populations practice shifting agriculture where suckers or cuttings are transplanted with the use of digging sticks, although there is variation as to whether people used mulching or burning in their preparation of gardens in the past (Hyndman 1979: 89-91; Huber 1973: 66-69). Another important similarity is that there is usually only one cropping before a fallow period of between fifteen and thirty years. However, in parts of the highlands where the cultivation of sweet potato has been more important, fallow periods are somewhat shorter and multi-cropping did occur (Allen et al. 2002; Bourke et al. 1993).

The major difference between the regions at the time the collections were made was the degree to which people relied on horticulture for their staples. People of the lowland plains and to a lesser extent the hills environment of the West Range and Border Mountains, intensively harvested stands of wild sago and complemented this with a diversity of fruit and nuts that could be collected during the sago harvesting process. Consequently gardening was only a subsidiary activity that included a diversity of cultivars such as taro, sweet potato, yams, breadfruit, bananas and coconuts (Appendix 8a and b, Craig 2002: 2; Huber 1973: 62-81; Jeffries 1950; Kelm & Kelm 1980: 115; McCarthy 1936). It is also important to note that the climate in the lowlands and in the hills is moderately seasonal; planting occurs with

the coming of the wet and this means that the diet varies somewhat over the course of a year.

In contrast, in large parts of CNG, people practised a virtual monoculture dominated by taro (Appendix 8d).[9] Their gardening regimes involved short cycles of shifting cultivation with a series of plantings being made throughout the year, providing gardens at various stages of maturity (Ohtsuka 1994). Over the last four or five decades, however, there has been an increasing reliance on sweet potato which, unlike taro, matures within a single year, thrives above 1500 metres, can grow on lower valley slopes and floors that have poor soils unsuitable for taro, and provides excellent pig fodder (Eggertsson 2003: 19-22; Hyndman & Morren 1990; Jones 1980: 11-16; Jorgensen 1981; Kuchikura 1990; Morren 1986: 90-100, Poole 1976: 255-300).

The use of sweet potato provides another measure of difference in the study region, as it was important in some areas during the period in which the major collections were made. It must be pointed out here that the economic and social changes brought about by sweet potato for other New Guinea highland societies — what has been termed the 'Ipomean revolution' — had not occurred in CNG (c. f. Watson 1965). Rather, the adoption of sweet potato has been argued to have been either a response to critical limitations of taro horticulture in the face of environmental degradation (Hyndman & Morren 1990: 21); or to a need to increase domesticated pig populations to replace wild animal stocks lost through forest degradation (Craig 1990b). [10]

While it must be acknowledged that there have been higher population densities in regions where sweet potato is the dominant staple, there were no patterns of large scale gardening that could provide a surplus and lead to major changes in social patterns. There is no evidence for major differences in social complexity or in settlement permanency, size or density between CNG groups that favoured either sweet potato or taro.

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[9] Indeed some groups in the highlands have over fifty varieties of taro (Hyndman & Morren 1990: 22)

[10] It has been claimed that some Mountain Ok groups adopted cannibalism to supplement their protein intake (Dornstreich & Morren 1974).

In both the lowlands and highlands, hunting involved the exploitation of a broad range of marsupials, cassowaries, birds and fish, but the main focus was on the hunting of feral pigs, which are found across the range of environments (Huber 1980; Jorgensen 1981, 1983; Kelm and Kelm 1980: 59). The major difference was that lowland groups had access to a greater diversity of mammals and reptiles, and, most importantly, feral pigs were more abundant as was fish as an alternative protein source (Appendix 8c).

Because of the relative paucity of game, highland groups developed a form of pig husbandry involving a stock of semi-domesticated breeding sows which for much of the time were allowed to roam free, enabling them to consume wild fodder and to be impregnated by feral boars (Appendix 8e, Cranstone 1990: 40; Morren 1986: 88-89). While the lowland groups did not practise pig husbandry, they sometimes supplemented their protein by rearing captured feral piglets (Gell 1975: 17; Juillerat 1982: 287).

In essence, the marked difference in the geography and environment of the two regions is reflected in some crucial differences between the two subsistence patterns. In the relatively homogenous environment of the lowland plains, resources are more evenly distributed and accessible, and subsistence activities are less regimented and require little intensification. In the relatively heterogeneous environment of CNG, wild resources and arable land are distributed irregularly and are limited. Subsistence activities, undertaken by the family or spousal unit, were geared towards horticulture and required significant mobility.

The hills environments are a transitional zone but more closely resemble that of the plains because the exploitation of sago is the dominant subsistence activity, one that also provides opportunities to hunt and gather wild foods. It is important to note here that some highland fringe groups, such as the Mianmin in the northern limit of CNG, in more recent times have moved into a lowland zone in the foothill fringe of the West Range and adopted some lowland subsistence strategies (Morren 1986: 283).

4.2 Agricultural classes

The subsistence system classes identified for the study area are based on those determined by the Papua New Guinea Agricultural Systems Project (PNGASP), undertaken by the Department of Human Geography, Australian National University (see map, Appendix 6). Their data were collected in the field through the 1980s and early 1990s, and supplemented with information in field notes and publications of anthropologists, ecologists and patrol officers who had visited the region previously (Allen et al. 2002; Bourke et al. 1993).

4.2.1 The USB and Border Mountains

As mentioned above, people of the USB plains and Border Mountains, and to some extent the West Range, are heavily reliant on wild foods, especially sago. There are, however, two important differences between the horticultural regimes used in these areas and these are reflected in two classes established by Bourke et al. (1993) that were adopted for this study.

Subsistence Pattern 1 (SBST 1)

For this study, the West Sepik Agricultural System (WSAS) 4 (Bourke et al. 1993: 29-31) has been renamed Subsistence Pattern 1 (SBST 1). This was found to be ubiquitous for the riverine and plains groups of the USB, as well as for communities on the lowest slopes of the West Range, all of which are situated within an altitude range of fifty to 150 metres ASL. The key criterion for this system is the intensive harvesting of sago, and that horticulture is less significant than anywhere else in the study region.

The most important cultivars were bananas and, to a lesser extent, taro and yams; sweet potato and tapioca were not observed (Allwood 1957). Of all the adopted cultivars, bananas were the most important and regular food. Supplementary crops also included tu-lip ('two-leaf') tree (*Gnetum gnemon*), sugar cane, 'pitpit' and arboreal products such as breadfruit, pandanus and coconut. Gardens were relatively near the settlements but they were irregularly planted, semi-tended and, rather than following any particular cycle, were planted to correspond with shifts in settlement. Some consolidation of settlements and their gardens occur where there is greatest

elevation above the flood zone (Cottle 1953; Kelm & Kelm 1980: 143; McCarthy 1936: 18).

The most comprehensive field study of a group using such a regime was undertaken by Townsend for the Sanio-Hiowe of the Wogamush River, East Sepik Province, located about seventy kilometres east of the study area. Townsend (1969: 63) reported that sago provided sixty-seven percent of the dietary intake while other plant foods accounted for approximately twenty percent; tubers accounted for only one percent and fruits such as bananas and breadfruit around thirteen percent.

There has been no detailed study for plains groups of the USB but Laurie Bragge (1964) reported sago as fifty-two percent of the diet and about forty percent as non-sago cultivars and wild plants. This is consistent with observations by other patrol officers (e.g. Knott 1964). The discrepancy between these and Townsend could be accounted for by breadfruit which was probably in season at the time of Bragge's visit and therefore supplemented the sago diet. Significantly, both populations relied little on tuber crops (between one and two percent), although availability of tuber crops was seasonal (Geyle 1954).

Subsistence Pattern 2 (SBST 2)

The West Sepik Agricultural System (WSAS) 7 (Bourke et al. 1993: 36) has been renamed Subsistence Pattern 2 (SBST 2). This was found to be ubiquitous for the hills environments of the Border Mountains and corresponds with an altitude range of 100 to 800 metres ASL. The major difference to SBST 1 is that although sago was important, garden foods made up a greater proportion of the diet (Geyle 1954).

Gardening and sago exploitation was most intense during the wet season and people would spend much time in garden houses away from the main settlement (Gell 1975: 167). During the dry season, there was greater reliance on meat and fish, and on breadfruit and coconuts growing around the settlement. Border Mountains' people interspersed different cultivars throughout a garden with some planted at different stages in the garden's development. Banana, taro, tapioca, and various species of yam were grown more intensively and consumed more regularly than they were on the plains and, while banana was the most important of these, taro had

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a greater role than for the plains.[11] Yields from other cultivated trees, such as pandanus and tu-lip, were also important (Gell 1975: 16; Geyle 1954).

Gardening followed a swidden regime with a shifting cycle of around two years. Gardens were made on moderate slopes cleared of forest through felling and subsequent burning. In much of the southern and eastern region of the Border Mountains, gardens were large and whole hillsides were cleared, a process involving all or a large part of a community (Allwood 1956, 1957; Chisholm 1966; Cottle 1953; Hutchings 1968: 3; Hüsemer 1996: 22-23). These communal gardens were provided with a common fence to keep out pigs and were subdivided into small blocks allocated to the family units who contributed to the clearing (Gell 1975: 16; Mekea 1967: 5). Families had up to three gardens, sometimes in different plots, sometimes even in other community gardens, as this would ensure that at any time of the year at least one mature crop would be available for consumption (Allwood 1957; Dewar 1967).

Huber (1974: 68-70) provides an excellent description of Anggor gardens and the stages of their formation:

> [Initially] bananas and taro are intermittently planted throughout the plot. At the same time, a well defined border is usually created through the planting of an inner ring of edible sugar cane….. and an outer ring of inedible shrubs [that] create a weak hedge-like barrier…..Once the staples are in and sufficiently mature to provide shade, a small but important planting of yams is undertaken in the garden's centre. … It is in the midst of these transplanting and tending operations that the Anggor introduce the tree crops [pandanus and 'tu-lip'] which constitute the second phase of garden development and shape the fallowing process. These groves begin to mature and take over the plot in 3 to 5 years, after the first phase taro, banana and yams have been exhausted; the trees endure for perhaps 10 to 15 years until the surrounding bush begins to intrude vigorously.

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[11] Mekea (1967: 5) reported Yuri gardens as being dominated by banana and taro.

For many of the Dera, Waina and Amanab populations that subsisted in the northern and western region of the Border Mountains, while the preparation and planting of gardens was similar, community gardens were less common and gardens, on the whole, were smaller, more dispersed and more family based; this would have been accompanied by a greater reliance on sago (Corrigan 1960; Dewar 1967; Gell 1975: 16; Juillerat 1982: 288; Kaibo 1967).

The other important feature of the system is that some cultivation of sago was undertaken to extend its distribution and increase its production.[12] This involved the transplanting of sago suckers at the edges of existing groves and was carried out for future generations; these groves were inherited by siblings (Asmuth 1996: 24; Corrigan 1960; Huber 1974: 72; Juillerat 1982).

The only notable variations in SBST 2 are:
- Gardening appeared to be most intensive for the Yuri to the south and Anggor to the east, where large community gardens near settlements were more common; the reliance on smaller, dispersed family gardens was greater for the Dera, Amanab and Waina populations in the north and west.
- During the early period of pacification, sweet potato cultivation was not reported for Amanab and Anggor populations in the eastern Border Mountains (Allwood 1956; Chisholm 1966; Corrigan 1960; Dewar 1967), but was present in some Yuri communities in the south, some western Amanab and Dera communities (Borok 1965; Knott 1965), and Waina communities in the north (Dewar 1967). As many of these communities were administered by the Dutch, it is possible that sweet potato was introduced to at least some of these communities in the 1950s, although reports of sweet potato cultivation by Yuri communities as early as 1950 are significant (Jeffries 1950).

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[12] As will be pointed out later this manipulation of sago was reflected in sago's significance in the generative rituals of some Border Mountains' groups; these rituals were not as fully developed or expressed by plains' groups (Craig 1968c: 11-12)

4.2.2 CNG

CNG may be considered to have two major agricultural regimes. The one with the larger distribution comprises systems that involve the intensive cultivation of taro with only minor cultivation of other plants, including sweet potato. The smaller comprises systems that focus on sweet potato with taro as a secondary crop.

4.2.2.1 Taro dominant

Subsistence Pattern 3 (SBST 3)

Allen et al. (2002: 19, 23) and Bourke et al. (1993: 19) established two distinct systems for the taro-dominant regimes. The most widespread system, WSAS/Western Agricultural System (WAS) 1, (here SBST 3) is practiced within the altitudinal range of 1000-1800 metres ASL and accounts for subsistence regimes from the border with Indonesia to the headwaters of the Sepik River, including some high and mid-altitude fringe populations inhabiting the slopes to the north in West Sepik Province and to the south in Western Province. The most intensive regime — used by Telefol speakers in the inter-montane valleys — was a virtual monoculture of taro with fairly uniform swidden regimes that involved mulching and fencing, and a ritual complex associated with taro fertility (Jorgensen 1981). The Telefolmin also invested more time in their gardens than did other groups.

The Telefolmin seldom made large communal gardens. Jorgensen (1981: 57) reports:

> Each Telefol household maintains roughly a dozen or so….. gardens
> scattered throughout different tracts of bush, often accompanied by
> makeshift houses. At any given time some gardens will be bearing, others
> will require weeding, some will be in the process of clearing and planting
> while yet others will be nearing exhaustion….. On the average, a hard-
> working family will manage to clear and plant about one garden per month,
> replacing another that will be abandoned for the forest to reclaim.

Communities belonging to two other ethno-linguistic divisions that belong to the WAS 1 category, the Tifalmin and Mianmin, employed slightly different regimes from those of the Telefolmin. The Mianmin regime is probably the most divergent in that they had adopted a more regular pattern of settlement shifts and as a result

had less dispersed gardens — adjacent to settlements — with more communal participation in gardening activities (Morren 1986: 86; Mulcahey 1965). Contrary to some fringe groups, Mianmin reliance on taro was even greater than that of most CNG groups.[13]

Around the same period, Wheatcroft (1975: 65) reported that for some Tifalmin communities, sweet potato accounted for thirty to forty percent of starchy food. A small crop of sweet potato might be planted in the same garden as, but segregated from, the taro and mainly used to feed pigs. Aside from taro and sweet potato, banana and pandanus were traditionally the most important cultivars and pitpit, sugar cane and a variety of greens were grown (Morren 1986: 82).

For the southern slopes of CNG (400-1800 ASL), an area that includes Wopkeimin and Faiwolmin speaking populations, Allen et al. (2002: 23) define a third system, Western Province System 2, (here treated as a sub-system of SBST 3) which is a less intensive cropping system and has no predominant staple: a number of root tubers including taro, sweet potato, cassava and Chinese taro are reported for the system with a slight bias to sweet potato. However, Champion noted in 1927 that the Faiwol-speaking men of Bolovip displayed great pride in their taro (1966: 79) and it is apparent that at the time Barth (1975), Jones (1980) and Hyndman (1979) undertook field work in the 1960s and 1970s, many people were still almost exclusively growing taro as their major staple. Indeed, Hyndman (1979: 113), who worked with the Wopkeimin in the early 1970s, reported sweet potato comprised only four percent of the garden content. He also calculated that taro represented seventy-one percent of their total diet and eighty percent of all plant food consumed; sweet potato was rarely consumed and was cultivated almost exclusively for pig fodder (Hyndman 1979: 273).

What is more important, however, was that these mid-altitude 'fringe' groups adopted a shifting pattern of residence that took advantage of the four major environments within the 900 metre altitude range of their territory, although their

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[13] During a two week study of a Mianmin population's diet in 1968, Morren (1986: 81) determined that it consisted of around eighty-seven per cent taro by weight and ninety-six percent in terms of calorific intake.

gardens, villages and hamlets were situated in the mid-montane zone between 1000 and 1750 metres ASL.[14] Parties of women, men and children would shift to settlements nearest 1000 metres ASL to exploit stands of semi-cultivated sago palm and a diverse range of wild foods. This was done periodically each year for several days at a time, but no longer occurs due to the danger of malaria and other lowland diseases (Barth 1975: 42; Hyndman 1979: 78ff). In total, sago made up only two percent of the diet (Hyndman 1979: 273).

Like the Mianmin and some Border Mountains populations, the gardens of the Wopkeimin were often large and not far from their settlements.

> The typical Wopkeimin *colocasia* gardening pattern is for a man and his gardening partner (wife or sister) to establish a plot around 350 metres square nearby about six other gardeners. As gardening work continues, individual plots averaging 3000 metres square spread towards other individual plots until aggregate *colocasia* garden clusters are formed of about 22,000 metres square (Hyndman 1979: 113).

Barth (1975: 30-34) described a similar pattern for the Faiwol-speaking Baktamanmin but his description suggests that gardens there were both planned and established by the community as a whole.

4.2.2.2 Sweet potato dominant

Bourke et al. (1993) identified three subsistence systems (WSAS 3, 9, 10) at the eastern end of CNG, which was inhabited by the Oksapmin and Bimin-Kuskusmin. All are characterised by greater reliance on sweet potato, with some separation of taro and sweet potato gardens.

Subsistence Pattern 4 (SBST 4)

Bourke et al. (1993: 25, 43) determined two systems for the Oksapmin area: one for the Tekin 2 Valley (WSAS 10) and one for the Tekin 1 Valley, around Oksapmin, the Ariga Valley and in the Bak Valley (WSAS 3); these systems operate within

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[14] This altitude range is the largest for any group in the study region and very different from the Mianmin of the northern slopes, whose communities tend towards a more horizontal regime of settlement shifts.

altitude bands of 1700 to 2200 ASL and 1200 to 2200 ASL respectively. These two systems have been conflated into one category Subsistence Pattern 4 (SBST 4) for this study. For both, the major criterion was the predominance of sweet potato, with taro of secondary importance and only a small range of greens and other vegetables. West (1951) and Perey (1973: 45) reported significant groves of *Pandanus julianetti* from which nuts were harvested and roasted (Appendix 2e).

The subsistence system of the Ngalum of the Tsop and Sibil valleys in [West] Papua appears to have belonged to SBST4. The PNGASP gives information only for Papua New Guinea; the best data for the Ngalum is provided by Brongersma and Venema (1962) and Reynders (1962) of the 1959 Dutch Star Mountains expedition. Brongersma and Venema (1962: 91) provide the following description:

> The principal crops cultivated are batatas (sweet potato; *Ipomaea batatas*) and keladi (*Colocasia esculenta*). The sweet potato gardens lie on the slopes, and the keladi gardens are generally lower in the valley [this is the reverse of what the eastern Mountain-Ok do]. The normal diet consists of batatas — known as 'boning'; keladi, here called 'om', is eaten at certain ceremonies only.

Reynders (1962: 56) confirms that sweet potato was the dominant cultivar for the Ngalum. Aside from the reversal of the altitudes at which taro and sweet potato are grown, the Ngalum system is a combination of aspects of all three eastern Mountain Ok systems of Bourke et al. Like the Oksapmin, the Ngalum used fire to kill trees and to clear foliage from their gardens, and they also separated their taro garden from sweet potato and other cultivars (Reynders 1962: 49). The major difference between the Ngalum and the eastern Mountain Ok groups is that the former live and subsist at lower altitudes, i.e. between 1350 and 1600 ASL (Hyndman & Morren 1990: 17).

Subsistence Pattern 5 (SBST 5)
The third system of Bourke et al. (1993: 41), WSAS 9 — classified as Subsistence Pattern 5 (SBST 5) for the purpose of this study — is characteristic of the Bimin-Kuskusmin south of Tekin 2 Valley (1600-2200 metres ASL). Like the Oksapmin, they plant separate gardens for taro and sweet potato, with taro at higher altitudes,

reserving sweet potato for the poorer soils on the lower slopes (Bayliss-Smith 1985; Poole 1976). The only difference to SBST 4 is that taro and sweet potato are more or less of equal importance. Bercovitch's (1989) data for the Atbalmin who live on the steep northern slopes of the Star Mountains in PNG (800-1600 metres ASL) seems to suggest that although the Tifal speaking area has been ascribed WAS 1 this section of the population may have tended toward a (SBST 5) pattern.

5. Settlement patterns

5.1 Introduction

Considering the significant reliance on wild resources and the shifting nature of horticulture, it would seem that throughout much of the study area the obstacles to maintaining large long term settlements were somewhat prohibitive. Nevertheless, there were several important functions provided by larger settlement including:

- Ensuring some level of security: the threat of attack, in the form of direct violence and sorcery, was a common concern for individuals and small family units (Roscoe 1996; Kelm 1990).
- A means of pooling reproductive capacity and managing marriage exchange (Gell 1975: 28).
- The securing of access to land through a collective reckoning of use rights (Kelm and Kelm 1980: 222).
- The maintenance of human and natural fecundity through ritual and the regulation of production and consumption (Morren 1986: 203ff).

Beyond these considerations it must be acknowledged that settlements provided a network of sociality and friendship that, as Ruth Craig (1969: 177) pointed out, were difficult to relinquish. Accordingly, settlements of one form or another were present throughout the study area but these varied significantly according to environment.

5.2 Settlement and social group formation

The description that Pouwer (1964: 141) provided for what he considered the most disaggregate and indeed unambiguous communal unit for the Ngalum of the Star Mountains is one that can be applied to the study region as a whole:

> …..the nuclear family is conspicuous. It is an independently operating work, residential, consumption and property-owning unit, usually with its own house, garden plot, and routine.

Larger descent and communal units were essentially fusions of these familial units, and these were made according to various affiliations including the common link to land. Cooperation between them most commonly involved the production of food –

whether it was gardening or sago processing – and sharing of food (Brumbaugh 1980b: 30; Pouwer 1964: 138; Townsend 1969: 173).

The largest communal units were often constituted through the coalescence of a number of smaller descent units that resulted from the fissioning or depopulation of former settlements and social aggregates. These processes of fission and accretion could involve any form of social unit such as clans and lineages, families or individuals (Huber 1974: 40; Gell 1975: 37; Morren 1986: 244). The Anggor village of Wamu provides a good example of how diffuse a community's origin may be: fourteen out of the sixteen Wamu lineages reputedly originated from other villages (Huber 1974: 273, Table 5). The size of the unit determines its status in the new village. If the lineage or segment is large it will maintain its clan status and if it is small it may be absorbed into a clan with its lineage status intact.

5.3 Settlement types

When most of the ethnographic material was collected, around 20,000 people lived in the USB and Border Mountains, and around 35,000 people in CNG (see Section 9.2). Traditional settlements throughout the study area followed the four general patterns that are found throughout New Guinea and can be described as small homesteads, large communal houses, hamlets, or villages (Allen 1983: 18). A discussion of housing types will not be included in this particular study; however photographs of some typical housing styles are included in Appendix 9.

Unlike some villages further down the Sepik River and in the highlands to the east that have populations up to a thousand people, settlements throughout the USB, Border Mountains and CNG have comprised relatively small populations of between fifty to 250 persons. In the context of this study, the composition of the four classes of settlements can be described as:

1) homesteads: two to three houses, twenty to thirty people
2) large communal houses: one house, twenty to fifty people
3) hamlets: up to five houses, forty to ninety people
4) villages: more than five houses, 100 to 250 people

Where there were many houses, they were usually set around a plaza (Appendix 9c). Some settlements included additional buildings such a permanent ritual structure and menstrual huts and in some areas the married men and/or young bachelors resided together in a separate building (Craig 1969b; Jones 1980: Map 3).

All settlements had a defined territory with land dedicated to either horticulture or hunting and gathering wild resources (Huber 1980: 45; Morren 1986: 249; Ohtsuka 1994). The access to land for gardening or hunting and gathering determined the position of the settlement. Ecological constraints to larger settlements included the type and range of cultivars and the nature of rainforest soil, which is usually exhausted after a year of cropping. Thus even where gardens did provide a greater proportion of the diet, the short period of cropping and long fallow required that gardens be established at greater and greater distances from the settlement. In some CNG communities and the Border Mountains, this problem was overcome somewhat by greater use of garden housing (eg. as among the Telefolmin, Jorgensen 1981: 151). In other areas, the settlements, or parts of them, were rebuilt close to the new gardens every generation, or at least every second generation (Barth 1971: 188; Morren 1986: 198-202; Ohtsuka 1994: 405; Peter 1990: 245). Indeed, the few lowland groups that were more reliant on gardening shifted every few years because the surrounding gardens were depleted (Thurnwald 1914: 342-43). However, where sago was the main staple and horticulture of less significance, settlement relocation was more often related to the depletion of wild game and social instability (Barry Craig pers. comm. 2006; Townsend 1969: 96).

Sometimes the pressure to relocate provided the opportunity for a split in the community resulting in the relocation of part of the population to new territory or to join another community (Juillerat 1992a: 5; Morren 1986: 245-47). Major settlement shifts were also caused by misfortune befalling a community, such as sickness (sorcery), a perceived decline in fecundity, or conflict (Barth 1975: 22).

In parts of CNG, the Border Mountains and the Yellow River area of the USB, communities ranged from dispersed affiliated hamlets or hamlet clusters of up to 200 people, to villages of 100 to 200 people. Hamlets were the most common settlement form throughout CNG and the northern region of the Border Mountains,

while villages were more apparent in the eastern Border Mountains, Yellow River and in the inter-montane valleys and southern slopes of CNG. In the inter-montane valleys, villages and hamlets were located on the wide valley floors (Craig 1969b). In the northern slopes of the highlands, and in the hilly country of the Border Mountains, villages and hamlets were located on ridges above the narrow valleys for security, while still providing reasonable access to gardens on the slopes and to stands of sago palms in the valley bottoms (Bercovitch 1989; Huber 1974: 33; Morren 1986: 72-5).

Both of these settlement patterns, the village and hamlet cluster, could involve a dual residence pattern, the settlement proper often remaining relatively vacant with a large proportion of residents living as conjugal units in garden houses; a phenomenon that caused difficulty for anthropologists and patrol officers alike (Huber 1980: 46). Individual family units radiated out from the village into the hinterland to tend gardens and enjoy a period of relative privacy (Barth 1975: 26; 14; Huber 1980: 46; Gell 1975: 79; Jorgensen 1981: 151).

Confederacies of dispersed villages, hamlets or hamlet clusters represent the largest form of communal unit and is commonly referred to as a 'parish' in the literature, due to members being linked through local cult obligations, fictive descent and a network of marriage ties (R. Craig 1965; Morren 1974; Perey 1973; Pouwer 1964). Parishes were geographically delimited within large valleys and watersheds and were relative stable. In CNG, all parishes included a centrally located settlement with a cult house or cult houses where people from settlements within the parish congregated for ritual occasions and male initiation (Barth 1971: 174; Craig 1969b; Hyndman 1979; Jones 1980: 25). Thus social and domestic organisation was partitioned according to gender. The village living space was divided into male and female zones: the women, girls and pre-pubescent boys lived in individual family houses set around the central plaza and the men slept together in one or two men's houses located at the 'top' (upstream) end of the settlement (Jorgensen 1981: 149-155). In the Yellow River area, the arrangement was similar: the women and children lived in family houses set around a plaza and the men slept together in a large house at one end of the settlement (Craig 1975: 419-420, 440-1; Mitchell 1975: 417; Thurnwald 1914: 347).

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Many communities of the USB are now located along the course of the Sepik River and its tributaries (Appendix 9a). This is a relatively recent development made possible by the *pax Australiana*. Previously, most riverine settlements were small, set a little distance from the river on natural levees or high ground between the rivers and swamps. This provided a degree of security against flooding and raids from the river (Thurnwald 1914: 6). Elsewhere in the USB, settlements were located on the fringe of grassland or lowland alluvium forest close to swamps where stands of sago palms grew (Bragge 1964). In much of the USB, people lived in small homesteads, or large communal houses that contained a number of families or extended families (Conrad & Dye 1975: 11; Schultze-Jena 1914: *passim*). However, independent family dwellings have become more common due to government and missionary influence in the area since the 1950s (Appendix 9b, Craig 2002: 1-2; Craig 2008; Gell 1975: 11, Peter 1990: 247).

Section Three

6. A history of ethnography and collecting in the Upper Sepik

6.1 The early twentieth century

The upper course of the Sepik was first explored in 1910 by a joint Dutch and German expedition to identify a natural border between their two colonial territories (Netherlands Indies 1911; Schultze-Jena 1914). The objective was to find a river course that roughly followed the 141° meridian of east longitude. Consequently, considerable time was spent exploring the upper course of the Sepik. Small steam powered boats and shore parties were employed enabling advance members of the team to depart from the confluence of the October and Sepik Rivers and reach the northern foothills of the Star Mountains. The teams progressed as far as the confluence of the Din and Sepik Rivers at around 4°41' 00" S, 141°09' 00"E. Realising that the Sepik was going to remain on a relatively easterly course and that the terrain ahead was going to get progressively more difficult, the parties hastily returned to the October River, providing them no opportunity to observe the peoples of CNG.

Prior to this joint expedition, the Dutch had made an attempt to locate an appropriate river via Humboldt Bay on the north coast. After a number of futile attempts, the expedition travelled due south on foot in the hope that they would encounter a suitable river course further inland but no such river was found.[15] The expedition returned to Humboldt Bay via the Bewani and Tami rivers and, in doing so, its members were probably the first Europeans to cross the north-western region of the USB near the southern foothills of the Bewani Mountains.

The USB was more thoroughly explored and mapped in 1914 by the German geographer Walter Behrmann and the ethnographer Richard Thurnwald as part of the 1912-1914 Kaiserin-Augusta-Fluss multi-disciplinary expedition organised by the Berlin Museum für Völkerkunde (Behrmann 1922; Craig 1997; Juillerat 2000; Melk-Koch 1989; Thurnwald 1914; 1916). Thurnwald continued on after the main party had returned to the coast and explored a number of tributaries to the north and south of the Sepik encountering populations that spoke the Yuri, Abau and Namie languages. He was the first European to reach the source of the Sepik in the

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[15] The expedition was terminated after they found the Keerom River running east-west on Dutch territory, rather than north-south as they had hoped.

highlands of CNG, where he encountered relatively large Telefolmin populations in the Ifitaman Valley.

There is uncertainty concerning the scope of collections made during these early expeditions but the largest and relatively well-documented collection was made by the German contingent of the Dutch-German border expedition, led by the zoologist-geographer Leonhard Schultze-Jena; it is presently held by the Ethnologisches Museum in Berlin (Kauffman 1990: 592). I located some additional material, and found evidence of a collection from the Dutch contingent, but as will be discussed below, the bulk of this collection is thought to be in Jakarta, Indonesia.

6.2 The 1920s and 1930s: the early period of Australian exploration

The first exploration of the southern slopes of CNG, now part of Western Province, was undertaken by Leo Austen for the Australian administration of Papua in 1922 (Austen 1923a; 1923b; 1926). Leo Austen was an Assistant Resident Magistrate of the Western Division of Papua. He departed from Daru and steamed up the Fly River with the objective of exploring the area north from the junction of the Fly and Ok Tedi Rivers as far as the headwaters and make favourable contact with local populations along the way (Austen 1923a: 122). Austen carried out two patrols. On the first he explored the region between the Ok Tedi and Ok Mart (Wai Mari) rivers and on the second he turned his attention north to the headwaters of the Ok Tedi, reaching the southern slopes of the Star Mountains. After crossing a suspension bridge about seven kilometres north of the present mining town of Tabubil, he ascended a range on the southern flanks of the Kam Valley near the confluence of the Kam and Ok Tedi rivers, approximately 5°12' 00" S, 141°13' 00"E and, seeing the rough and seemingly impassable terrain ahead, decided to return south (Austen 1925: 33-34). This area is particularly rugged and contains only a small, dispersed population; Austen met few people.[16]

The most notable descriptions that Austen made of the culture of the region were not in reference to the Mountain Ok but the Ninggirum, a neighbouring Lowland Ok group, from whom he obtained a list of vernacular terms concerning material culture

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[16] The previously mentioned Wopkeimin who speak a dialect of the Tifal language.

found in the villages (Austen 1925: 30). It is worth noting that most of these terms are cognates of those used by the Mountain Ok, demonstrating the existence of a common heritage for the Ok populations of CNG and the lowlands of the upper Fly River.[17]

It appears that Austen had no specific strategy for ethnographic collecting and acquired only a few pieces in a somewhat sporadic and opportunistic fashion. It also seems that he was of the opinion that the material culture throughout the Upper Fly region was relatively homogeneous (Austen 1923a: 135). Austen collected relatively few objects in the foothills of the Star Mountains but the collections from the Ninggirum, Awin and Yonggom populations in the lowlands are more representative.[18]

Between 1927 and 1928, Charles Karius – also an Assistant Resident Magistrate of the Territory of Papua – led two expeditions with the intention of crossing New Guinea via the Fly and Sepik rivers (Karius 1929). He was accompanied by Ivan Champion, an experienced patrol officer (Champion 1966). Karius and Champion originally followed Austen's course up the Fly River but instead of seeking a route into mountains via the Ok Tedi they followed the Fly River to its source. The main obstacle between the Fly and Sepik headwaters was the Hindenburg Wall, a massive limestone escarpment that runs east to west along the southern flank of the Star Mountains (Karius 1928). During the first attempt, they succeeded in contacting a significant Mountain Ok population of Faiwol speakers at the village of Bolovip.

On their second attempt, with help from local guides, Karius and Champion were able to locate a suitable pass over the Dap Range to the headwaters of the Sepik and made contact with the Telefol-speaking Feramin (Champion 1966: 162-164). From there they travelled onto Ifitaman where they, like Thurnwald, encountered the relatively large Telefolmin villages (Champion 1966: 168-173; Karius 1929: 314). The expedition followed the Sepik downstream, west through the ranges and then

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[17] The Lowland Ok, however, do not share important cultural traditions such as the Afek creation myth which is common to most Mountain OK communities (Brumbaugh 1990: 57)

[18] After our survey it became apparent that almost all of the material came from the lowlands probably because much of the area is within distance of navigable sections the Fly and Ok Tedi Rivers where Austen would have had more capacity to collect objects.

north to the lowlands, observing only the small and scattered Atbalmin communities along the way. On reaching the lowlands, they built rafts and navigated the Sepik River through its confluence with the October River, from where they were transported by a ketch down the rest of the Sepik's course.

Unlike Austen, whose objective was to survey a circumscribed region and its people, Karius' and Champion's venture was not conducive to the making of an ethnographic collection. Their subsequent publications, however, provide compelling accounts of Mountain Ok communities. Champion recorded accurate descriptions of some local customs, and sensitive and enlivened descriptions of personal exchanges with local people. These accounts, supplemented by dramatic photographs,[19] include a vivid and accurate picture of the region's geography.

6.3 The 1930s: mineral exploration and the start of pacification

In the 1930s the Upper Sepik region was surveyed for mineral deposits and two important ethnographic collections were made. The first of these was made by Ward Williams and Stuart Campbell during a gold prospecting expedition into the highlands of CNG in 1935-6 (Campbell 1937, 1938; Kienzle & Campbell 1938; Williams undated).[20] Campbell, who had been the pilot for Douglas Mawson's 1911 Antarctic Expedition, became the first man to fly into the highlands of CNG and made several aerial surveys in the process. He was preceded by a forward patrol to the Ifitaman Valley that established a temporary landing strip at what was later to become the Telefomin patrol post. From their base in the Ifitaman Valley, members of the team undertook several prospecting missions along tributaries of the Upper Sepik, including the upper courses of the May and August rivers, during which they were the first to encounter the Mianmin.

Williams's and Campbell's expedition marks the beginning of serious ethnographic interest in the region. While it is still unclear exactly where the objects were collected, it seems likely that the majority were brought to Campbell and Williams by villagers in the immediate area around what is now Telefomin. While it is

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[19] A Bolovip houseboard, photographed by Champion in 1927 (Champion 1966: plate opp. Page 66), was photographed by Craig in 1967 (Craig 1988: ill.2).

[20] Williams's collection is in The Los Angeles County Museum of Natural History and Campbell's is in the Australian Museum, Sydney.

uncertain whether Williams and Campbell intended to collect such a large quantity of material, they seemed to have initiated many of the transactions after what appeared to be a rather tentative period of bargaining between the parties:

> The natives came up early to trade this morning and amongst other things they wanted to part with, was a string bag. Wallace [Kienzle] had tried to get one of these before, without success, so thinking it rather a treasure, we gave the boy an old pyjama jacket for it. Almost immediately we were offered all the string bags we could want….. (Campbell 1937: 26).

Many of the transactions were probably undertaken as a way to imbue trust and establish a rapport between the explorers and the local people (Campbell 1937: 41) and it is also clear that Campbell and Williams actively sought prestige male items, especially those that were visually impressive (Campbell 1937: 27). However, the collection is comprehensive and suggests an intention to be representative. Williams and Campbell also published useful information, most notably Campbell's extraordinarily vivid and sensitive presentation to the Royal Geographical Society in 1938 (Campbell 1938). This paper, like Karius's and Champion's accounts, also contains accurate and detailed descriptions of cultural and subsistence practices. Likewise, Campbell's respect for and interest in the material culture is apparent from the manner in which he documented his collections at the Australian Museum in Sydney.[21]

The other major collection of the 1930s, and the first made in the USB since the German and Dutch expeditions, was made in 1938 by H. D. Eve, a surveyor for Oil Search Limited.[22]

The journey Eve made was remarkable. He walked from Maimai in the Torricelli Mountains to the mouth of the Yellow River then travelled by schooner to the mouth of the Hauser River from where he took a team to a location near to what is now Green River Station to establish a base and landing strip. During his surveys

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[21] Campbell provides each object with functional title—sometimes with information concerning the material used—and the local vernacular; quality of information which is often missing from the collection notes made by subsequent collectors.

[22] 337 of Eve's objects are held in the Australian Museum; importantly he ensured that every object was accompanied by the name of the village at which it had been collected.

Eve walked hundreds of kilometres through swampy and forested terrain, often surviving on food he obtained from local villagers or found in the surrounding environment (Sinclair 2001: 194-195). Eve spent a month in the Green River area and undertook at least one trek into the Border Mountains passing through communities belonging to five different language groups.

While Eve is certainly the first person to have collected from most, if not all, the locations credited for the objects, we do not know the full extent of his travels as only a few villages and his final route from Green River northeast to the Yagroner Hills are plotted on the one surviving field map.[23] Unfortunately, on the journey to the Yagroner Hills, Eve caught scrub typhus and was transported to Wewak, where he died soon after. It is possible that some of his collection and collection notes were lost in the process. However, the list of village attributions for the objects survived and accompanied the collection when it was donated to the Australian Museum. Such information is, of course, crucial to the present study but the object list is also the only other evidence with which to reconstruct Eve's travels. As far the collection is concerned, all but five of the objects are smoking tubes and 116 of these come from one village in the Yellow River area where smoking tubes are extremely elaborate and obviously appealed to Eve. The smoking tubes come from a total of seven language groups within the study area and provide the best sample of the form for the region.

The next expedition to CNG was undertaken by Jim Taylor and John Black as part of the famous Hagen-Sepik Patrol of 1938-39 (Black 1939a; 1939b; Gammage 1998). In July 1938, Black crossed the Strickland River and headed west towards the Ifitaman Valley where he made his base. Unlike Karius before him, Black encountered large numbers of people in the eastern valleys of CNG, including Bimin and Oksapmin speakers, who reacted aggressively to the intrusion. There were some confrontations, including loss of life. In contrast to these groups, Black found the Telefolmin enthusiastic and welcoming, probably due to the favourable and productive exchanges that occurred during previous expeditions.

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[23] Held by Oil Search Ltd in Sydney.

Black stayed in Telefomin for several months to establish a base and rehabilitate Campbell's airstrip. Taylor then joined Black at Telefomin in December of that year and together they explored the route north to the Sepik via the May River. In doing so they took a course through territory inhabited by the Mianmin, with whom they had violent exchanges, again resulting in casualties. Black returned to Telefomin and stayed there until January 1939 while Taylor travelled down the May River to the lower Sepik before reuniting with Black at Porgera in May. They returned to Hagen on June 19, 1939 just prior to World War Two, which interrupted the exploration of the region. John Black made a small collection of Mountain Ok pieces and sixteen are now in the South Australian Museum. Unfortunately, there is little information concerning the provenance of these objects.

During the War, although the activities of the Australian administration and prospectors ceased, there were two notable occasions of contact. The first involved the evacuation of eight Australians from the North Coast of New Guinea, led by Jack Thurston in 1942. The party travelled up the Sepik and May rivers in canoes and found temporary shelter at Telefomin before crossing to the headwaters of the Fly River from where they followed the Fly River downstream to Madiri at the river's mouth. The other involved the establishment of an emergency landing strip at Telefomin by the Allies in 1944 for planes undertaking missions against the Japanese in the north (George Morren pers. comm. 2005). No ethnographic material or descriptions of local culture have emerged from these episodes.

6.4 Post World War II: The revival of ethnographic and anthropological interest in the region

The first significant expedition to the region after the war occurred on the Dutch side of the border.[24] In 1959 the Netherlands Association for Research in the Natural Sciences in the East and West Indies and the Royal Netherlands Geographical Society conducted a multi-disciplinary expedition to the Sibil Valley in the Star Mountains. Brongersma and Venema's (1962) account of the expedition is one of the most comprehensive geographical surveys of any region of CNG and

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[24] Although in 1949, 100 objects, mainly arrows, were collected by the botanist John S. Womersley (who subsequently became director of the Herbarium in Lae). These come from the Abau of August River and from the Namie of Yellow River and are held in the South Australian Museum. Very little information about this expedition has been found.

provides a detailed account of Ngalum-speaking Mountain Ok groups. Expedition members consisted of geologists, botanists, zoologists, medical officers, a linguist and an anthropologist, Jan Pouwer.

While Pouwer and other team members managed to collect almost 500 objects, there is no evidence of any method in the collection process or its documentation. It was only after the collection had been deposited at the Rijksmuseum voor Volkenkunde (RMV) in Leiden that an attempt was made to assess and contextualise the objects. This was done by curator Simon Kooijman, who had not been a member of the expedition, and was published in 1962. Kooijman presents a valuable and insightful overview of the collection, assembled from fragmentary information provided by various members of the expedition, but there were significant omissions in both the content of the collection and the accompanying notes (Kooijman 1962: 16). His frustration is evident (1962: 15-16):

> The greater part [of the collection] comes from the area in the Sibil valley where the expedition had its headquarters. The people came here to exchange their ornaments, objects of daily use, and weapons for valuable European imported goods such as axes, knives, tobacco, clothing, etc. Of course, such a way of collecting was not very systematic. It is not surprising, then, that a closer inspection of the material …..showed that the collection did not represent a complete picture of the material goods…..Certain groups of objects were lacking.

However unsatisfactory the collection information, it remains the only substantial cultural dataset representing Ngalum speakers.
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6.5 The 1960s onwards: systematic ethnographic collecting and focussed anthropological fieldwork

The 1960s heralded the beginning of a significant period of ethnographic work in the study area and by far the most important collections were made during the 1960s and 1970s. The first of these, made in 1963-4 by Bryan Cranstone and David Lee, was the first ethnographic fieldwork undertaken by the British Museum and the first expedition in CNG with the primary purpose of making an ethnographic

collection.[25] Cranstone and Lee (1965a; 1965b; 1967; 1968; 1990) collected around 800 objects mainly from Tifalmin villages in the Ilam Valley west of the Ifitaman Telefolmin, and recorded important information concerning how objects were made, the materials used, and from where objects and materials were sourced (Cranstone 1964a; 1964b). Cranstone also collected from the Telefolmin, and from the Ulapmin, a group located between Telefolmin and Tifalmin populations.

While Cranstone may have started with the objective of capturing a detailed snapshot of a remote and isolated culture with a lithic based technology (Cranstone 1990: 53), it soon became apparent to him that the foundations of the Tifalmin culture were underpinned by a regional network of resources and ideas (Cranstone 1971: 138; 1990). Cranstone provided the first insight into the importance of trade and interaction in a region where enmity and geographical isolation were significant constraints. He was also the first collector to allocate a substantial portion of the collection to the Papua New Guinea Museum.

Cranstone's expedition was immediately followed by an ethnographic survey of the USB by Douglas Miles for the Australian Museum in 1964-65. This trip was part of a larger Sepik survey by Miles and Stuart Cameron, both staff of the Museum. Miles and Cameron were allowed some discretion as to where they were to collect. In addition to working in the middle Sepik and Maprik (Abelam) regions, Miles decided to make a collection in the area surrounding Green River and Amanab patrol posts. His reasoning for this was that the middle Sepik region, known for its significant figurative sculpture, appeared to have been 'depleted of worthwhile' artefacts whereas the Upper Sepik, unrepresented in museums in Australia, could provide both a unique and rich collection (Miles & Cameron 1965: 3).

In late 1964, while Cameron worked at Maprik and at Chambri Lakes in the Middle Sepik, Miles went to Green River to survey the Abau and the peoples of the Border Mountains. Miles decided on this strategy because the data from the Summer

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[25] In n 1963, just prior to Cranstone's and Lee's expedition, M. J. Lewis, an Administration Medical Assistant, undertaking a medical patrol in the Bewani Mountain and northern plains of the Upper Sepik Basin collected 92 objects now housed in the South Australian Museum. Artefacts come from villages speaking Simog, Kwomtari, Baibai and Fas languages. The Lewis material is all we have from Simog and Fas speakers.

Institute of Linguistics suggested great linguistic diversity and he hoped this would be reflected by a similar diversity in material culture. Consequently, Miles decided to 'collect in at least one village representing each of these [language] families'.[26]

After making collections in villages around Green River Patrol Post, Miles walked north through the western part of Border Mountains to Sowanda. This took Miles through territory that, until 1962, had been part of a Dutch enclave incorporating approximately two hundred square kilometres of Australian territory (Douglas Miles pers. comm. 2005).[27] His route followed the Faringi (Dio) River north to Sowanda and then from Sowanda to the government post at Amanab. He explains that this route was 'very indirect' due to his desire to sample communities of all language groups (Yuri, Dera, Amanab, Waina and Anggor).[28]

Miles' determination resulted in an extensive survey comprising 550 objects from villages within the Amanab and Green River sub-districts, representing up to seven language groups. It must be considered the most comprehensive and representative cross-sections of material from the region apart from those collected by Barry Craig. It is also likely that some of the villages from which he collected have not otherwise been visited by collectors. Most unfortunately, however, the whereabouts of Miles's field notes is unknown and the registration of the objects at the Australian Museum is incomplete and does not include the names of the villages where the objects were collected. Consequently this otherwise extremely important collection could not be used in the present study.

In 1964, Barry Craig collected over 340 pieces from CNG for the Australian Museum at the request of Miles, who had made a brief stopover at Telefomin on his way to Green River. Inspired by Cranstone's fieldwork, and sharing Miles' desire to explore the cultural and linguistic diversity of the region, Craig subsequently undertook two expeditions to the USB in 1968 and 1969, making two collections

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[26] Letter from Doug Miles to Fred McCarthy. 4th November, 1964 (Australian Museum archives).
[27] The region was far more accessible from the Dutch side and so they took responsibility for its administration by agreement with the Australian administration.
[28] Letter from Doug Miles to Dr. John Evans, Director, Australian Museum. 12th November, 1964 (Australian Museum archives).

each consisting of around 2000 objects.[29] 'Duplicate' parts of the collections were sent to each of the three sponsor museums with a fourth set provided to the PNG Museum. The present study has brought together these four separate components of each collection.

Craig then undertook fieldwork in 1972-3 in CNG and the USB to collect for the Commonwealth Arts Advisory Board in Canberra (Cochrane 2007). Around 120 pieces were collected from CNG, 270 from the Idam Valley south of Green River, and another 270 from the area between Green River and Ambunti on the middle Sepik (Craig 1973). This collection did not become part of the National Collection in Australia as originally intended; it was eventually added to the collections of the Papua New Guinea National Museum and Art Gallery (PNGNMAG).

Like Miles, Craig actively sought representative collections from each language group and his collections provide the foundation for the Upper Sepik-CNG Project. Throughout the second half of the 1960s, Craig increasingly became interested in identifying the processes responsible for the diversity he had observed in culture across the communities he had visited; he believed these patterns could reveal historical relationships between the various communities and language groups. These motivations first became explicit in Craig's grant proposal to the Wenner-Gren Foundation in 1968 (Craig 1968b).

One particular feature in the Upper Sepik's linguistic picture that suggested a relatively recent movement of populations, and aroused Craig's curiosity, was a westward projecting salient of Sepik-Ramu speakers (Abau) between Yellow River and the international border. The language groups to north and south are geographically restricted isolates suggesting that the Abau intrusion had dislocated these populations.[30] Craig believed that the spatial patterning of cultural material could provide further clues to the history of such population movements. Consequently, over the next few decades, Craig analysed some of these collections

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[29]Craig was sponsored by three museums and a grant from the Wenner-Gren Foundation. The three museums were: Museum für Völkerkunde, Berlin; Rijksmuseum voor Volkenkunde, Leiden; Australian Museum, Sydney

[30] Craig was to find further evidence for this migration in the origin myths in Abau oral history (Craig 1968b: 7-8; 1980b: 8).

to identify correspondences and differences in technology and style (eg. Craig 1990a; see also his account in Craig 2005c).

Prior to his research in the USB, Craig investigated the differences in designs carved and painted on house boards and war shields in CNG (Craig 1969b). He was well prepared for this exercise as he had travelled throughout the region and photographed and documented every shield and house board he came across including the date of their facture. As part of his analysis, Craig quantified the distribution of specific design traits across the closely related groups of the Mountain Ok. One of the most important observations that Craig was to make was that the frequencies of particular designs exhibited unimodal patterns through time (a phenomenon known as 'fashion') and that designs also demonstrated a clinal spatial pattern (Craig 1969b: 175-177, 296). He also inferred that some of the 'techniques applied in creating [an] object' could be seen as genetically guided and were likely to distribute according to lines of descent (Craig 1969b: 207). Over the next three decades he continued his interest in these topics (Craig 1976; 1990; 2005c).

Three more significant ethnographic collections were made in the study area in the second half of the 1960s. The first was made by the Swiss ethnographers Meinhard and Gisela Schuster for the Museum für Völkerkunde in Basel. The Schusters' main focus was the group they called the 'Eriptaman',[31] from whom they collected around 360 objects, the majority of which came from the village of Plantevip (Balantavip) (Schuster 1967; 1969). The Schusters also made significant collections from the Mianmin at Usage, from the Iwam and Awai along the middle May River, and from among the Namie of the Yellow River. Their collections include a wide range of artefacts and the documentation is thorough.

The second collection was made by Hanns Peter, Curator for the Department of Oceania and Australia at the Museum für Völkerkunde, Vienna. Peter made several field trips between 1969 and 1987 among the Yuri (whom he called the Gargar) at the southern end of the Border Mountains. Apart from a collection of 750 objects in

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[31] Eriptaman or Eliptaman as a group name is a misnomer. It means the valley (*taman)* of the Elip River. The people of Eliptaman speak Telefol and belong to several parishes with close links to the Telefolmin of Ifitaman (the valley of the Ifi River).

the museum in Vienna, there are ninety objects in the PNGNMAG. In Vienna, however, I was to learn of two other collections from Peter: one in the Museum der Kulturen in Basel (seventy objects) and another in the museum at Göttingen University (150 objects). The collection in Vienna had not been fully documented prior to the termination of Peter's tenure as curator, but the collection housed in Göttingen proved to be invaluable because of the detailed information provided.

Peter's interest in material culture is reflected in the extremely large and representative sample from the Yuri village of Kamberap where he spent most of his time. The sample consists of over 650 pieces and is by far the biggest from any village in the USCNGP's study area. While some of the material had been collected to satisfy sponsor institutions, it is uncertain why Peter collected such a large quantity of objects. The fact that there is a significant amount of duplication in what Peter collected suggests that the local population may have been active in producing exclusively for his collection. Whatever the reason, the collection provides an unrivalled representation of the diversity of material culture found in the region.

A large multi-village collection from the Border Mountains was made by the French anthropologist Bernard Juillerat during a period of fieldwork in the Amanab language area in the early 1970s. During this period, Juillerat's focus was the Yangis, an important generative ritual in the region. Juillerat's collection and work is important because ritual associated with the Yangis is common to generative and therapeutic rituals found throughout the Border Mountains and in much of the USB; the distribution of these related forms represents one of the most intriguing cultural phenomena of the region (Craig 2002: 4; Gell 1975: 156ff; Juillerat 1992b; Mitchell 1975). Juillerat's collection has a large component of painted sago spathes, which are the major component of the costumes and masks worn at such ceremonies, but there is also a broad range of artefact classes. Juillerat collected samples from three Amanab villages and four Kwomtari-speaking communities to the east. His collection is divided between the Musée du quai Branly in Paris (258 objects) and the PNGNMAG (255 objects - not all of which could be located).

Also in the Border Mountains, another anthropology student who provided a small but important collection was Peter Huber, who worked from 1969 to 1971 with the

people of Wamu, an Anggor-speaking village. Huber's (1974) objective was to explore the ways in which the Anggor conceptualise kinship and how they structure their social relationships. In his thesis Huber provides a meticulous description of Anggor society and demonstrates how Anggor kinship is shaped through accumulation of social experience. Such observations provide an important insight into the social flux of the Upper Sepik. The process of collecting was obviously very much an adjunct to Huber's research and the range of material is somewhat limited considering the time he spent in the region. Nevertheless, the arrows Huber did collect are impressive, as are the two cuirasses, a class that other collectors found difficult to obtain.

Another significant multi-village collection was accumulated by Antje and Heinz Kelm in 1970, from villages belonging to three related languages, Namie, Ak and Awun who live in the lowland swamps and grassy plains of the Yellow River area. The 420 piece collection, which is housed in the Ethnologisches Museum in Berlin[32], contains a comprehensive range of utilitarian and ritual objects, especially when combined with other collections from Yellow River. The Kelms' collection was part of a detailed ethnological review undertaken in the eastern part of the USB. This study (Kelm & Kelm 1980), published in German, describes the region's environment and the full range of Yellow River subsistence and ritual practices, with illustrations and descriptions of the material culture. As with the Peter material in Göttingen, the Kelm's collections in Berlin and the PNGNMAG (seventy-five objects) are well documented.

Throughout the late 1960s to the 1980s several anthropologists, undertaking a wide range of studies in human ecology, and social and cultural anthropology, conducted fieldwork within communities throughout the Upper Sepik and CNG. Many did not collect while others accumulated only a small quantity of objects, such as Frederik Barth, whose 'Baktaman' (Baktamanmin) collection of objects is housed at Bergen, Norway. The degree to which they collected and recorded material culture varied greatly according to how important the objects were in the cultural and social practices that were relevant to their fields of interest, and how long they spent in the

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[32] Formerly Museum für Völkerkunde

field. Nevertheless, many of these adjunct collections have provided the only significant material for many villages in the study area and compose around twenty percent of the overall sample.

By far the majority of these sorts of collections come from CNG. Two of the most important were collected by students of human ecology studying subsistence systems of communities living in the mid-altitude fringe. The first of these was George Morren who, in the late 1960s, did fieldwork with a Mianmin community in the Hak Valley. The other was David Hyndman, who in 1973-74 worked with the Wopkeimin in the Kam Valley, on the southern slopes of the Star Mountains, near where Austen terminated his patrol in 1922.

Morren's collection, which numbers over 200 objects, and is the largest sample for this language group, comes from a population living at a higher altitude and subsisting in a substantially different ecology to that of the Mianmin at Usage where the Schusters made their collection. This is of particular interest to the project as the Mianmin are the only ethno-linguistic group with populations utilising lowland and highland subsistence strategies. Hyndman's collection is the largest made from the Wopkeimin, numbering over 150 objects. The documentation of both collections includes vernacular terms and information concerning the materials used in making many of the objects.

Several anthropology students made important collections during their fieldwork in the CNG. The earliest and most comprehensive of these was made in the Tekin Valley in the late 1960s by Arnold Perey who was investigating how the Oksapmin conceptualise and delimit their social relationships (Perey 1973). Perey initially collected with the objective of starting a craft trade so that the local people could earn additional income. Although this did not come to fruition, Perey collected over 300 objects from Betiana, the village where he was based, making it the most comprehensively sampled community in CNG.[33]

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[33] At the same time that Perey was working with the Oksapmin, another student, Wilson Wheatcroft, worked in the upper Ilam valley among the Tifalmin during 1969-71. Some of his collection, which included objects from the Wopkeimin and Atbalmin as well as the Tifalmin, was sold to Charles Rand Penney of Lockport, New York State (Penney 1988). This collection of 92 objects was included in this study and has since been donated by Penney to the South Australian Museum.

The next to make a collection in eastern CNG was John Fitz Porter-Poole, who worked with the Bimin-Kuskusmin in the early 1970s. The Bimin border the southern limit of Oksapmin territory. Poole's thesis is a structural interpretation of the ritual framework of the Ais Am, the Bimin male initiation cycle. The Bimin possess one of the most complex ritual programs of the Mountain Ok region, accompanied by an equally comprehensive ritual exegesis (Poole 1976). Poole's thesis provides a vivid account of the Bimin-Kuskusmin society, the geography in which they live and a narrative of daily activities. Considering the meticulous detail in his thesis, it is surprising that he made a relatively small material culture collection, with arrows notably absent. One of most important legacies of Poole's collecting activities is a set of catalogue cards that he handwrote for the PNGNMAG collection. These detailed notes contain some information on materials and function and are often as meticulous as his observations of other aspects of Bimin life.

Another student who undertook fieldwork in the region was Maureen MacKenzie who focussed her study on a particular class of material culture, the looped string bag. String bags are important in both utilitarian and ritual activities of the Mountain Ok. MacKenzie explored their construction and use but also the way they are used symbolically to emphasise particular socio-cultural and ritual distinctions. In the process she fully acknowledged and incorporated an emic approach in her assessment. While MacKenzie made only a small collection, of which parts are housed in the PNGNMAG and the Australian Museum, her work (1990; 1991) provides significant information concerning the techniques associated with string bag facture and has made possible a thorough identification of a range of formal attributes that can be used to compare string bags from different groups.

The most recent researcher to make a collection, Sveinn Eggertsson, worked with the Kwermin, a Bimin-speaking population living at mid-altitude south of the Bimin-Kuskusmin. Eggertsson's work, based on field research undertaken in the early 1990s, focuses on Kwermin cosmology, particularly the ontogeny of personal knowledge through the acquisition of social or ritual knowledge which the Kwermin metaphorically equate with the growing and shedding of skin (Eggertsson 1997; 2003). Eggertsson's work parallels that of Poole in that he provides a detailed

account and interpretation of ritual and a structural interpretation of the narratives that underpin Kwermin knowledge. Eggertsson's collection, which is like Poole's in that it is well documented, shows no preference for any particular object and, for its small size, provides a good representative sample. The material exhibits strong cultural affiliation with other Mountain Ok groups but also with lowland groups on the upper Fly River.

7. The data collection process

7.1 Introduction

Data collection for this project involved accessing museum and private collections around the world. The project's timeframe, the cost of accommodation and the required participation of people employed by the museums imposed considerable time and logistical constraints. It was therefore necessary that:

1) A database system was constructed to facilitate quick and easy data entry and retrieval, for use in the museums

2) Any information held by museums and other sources concerning the collections was requested so as to be accessible prior to the commencement of museum visits and scanned for possible anomalies and discrepancies and entered into the database system

An Excel database was prepared to accommodate this information and other information provided by the museum record and derived from the objects. A laptop computer was used to house the system and for recording and storing data. A digital camera was used to photograph the objects, their details and documentation relating to the collections. These images were hyperlinked to the Excel worksheet. Images were stored in individualized folders to ensure that the hyperlink would open all relevant photographs simultaneously for each individual object. Sometimes multiple objects were included in one photograph. When multiple objects were included in one image, individual detail images were placed in the same folder, and the images were named according to the order in which the objects were laid out – top to bottom or clockwise from top left.

The process began with the identification of sources for the dataset, which was based on information compiled by Craig since the 1970s. This included documents and field notes from various collectors and a photocopy of the register of the PNGNMAG. Requests were made also to the participating museums for any information such as collection notes, field notes and copies of registration files, including electronic datasets that could be imported into the database. Only seven museums out of seventeen had electronic database systems by 2005 and only three

of these had entered viable data into their system. Only one museum, the Museé du Quai Branly in Paris, was able to provide electronic records, including field notes and digital photographs, sufficient to extract all required data without the need for a visit.

An itinerary for a sequence of visits to museums and private collections was established once confirmation of access had been given. This turned out to be one of the most difficult aspects of the project to resolve and some trips had to be rescheduled. Some museums were in the process of moving collections to new storage, or had chemical contamination or other issues to resolve before access could be provided.

On arrival at the museums, I would:
- survey and assimilate all data in the register, catalogue cards, electronic database (when available) into my data fields;
- survey the collection area and establish the location of the collection in the storage area;
- set up a workplace to examine, photograph and record object attributes.

During the data collection I would:
- locate and verify objects, and reconcile the field number – when one existed – with museum accession number and collector notes in the database;
- photograph and record objects including any detail concerning their dimensions and technical attributes;
- identify and take note of any anomalies in the collection and museum records.

While at the museum I would also attempt to gather additional material not assimilated into museum databases or registers. This would involve:
- searching museum departmental and library records for documentation, such as field notes, collection notes and field trip diaries;
- searching the archives for documentation such as reports, correspondence, acquittals and other administrative documents;

- investigating any leads from these notes that could help identify additional information held in affiliated institutions such as public archives and state and university libraries.

One of the major concerns of the data collection process was whether field numbers had been allied with the museum accession numbers in the museums' registers. Barry Craig had attempted to secure his collection's provenance by keeping a personal record of the museum where each object had been sent and had managed to compile a relatively good record of the accession numbers given to each of the objects according to his field numbers, but even this protocol did not insure against errors and omissions. For other collections, where the collectors had not made similar attempts to ensure preservation of field numbers, data corruption and loss was significantly worse.

7.2 The discovery of additional material during the project

One important part of the data collection process was the discovery of additional material and collections. Many discoveries were made by perusing the register and other museum documentation or simply through identifying such material on the storage shelves by sight.[34]

One such discovery was made at Rotterdam. During my first visit I spotted a series of smoking tubes that were similar to Border Mountains examples I was familiar

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[34] In the Wereld Museum in Rotterdam, I identified a number of pieces this way, including two Mountain Ok shields collected by C. Groenvelt in the late 1950s. I learnt from Dr Kees van den Meiracker, curator for Oceanic collections at the Wereld Museum, that Groenvelt had been commissioned by the Museum to collect material from the Sepik region and was directed to potential collection areas via correspondence with the Museum's directors. This correspondence is the only documentation associated with that particular collection; little detail concerning the objects' provenance had been provided. Groenvelt travelled through the May River and Yellow River areas but his exact movements were not well documented and his collecting was unsystematic. It appears that he entered the region from the Waris and Jafé regions on the Dutch side of the international border. He then made his way eastwards to the Yellow River where he headed south making his way up the May River. Dr van den Meiracker subsequently explained that it was Groenvelt's practice to retrospectively give attributions to the objects after he had made a representative sample from an area. Groenvelt supplied only the official names of the culture/language groups and, as far as geographical information is concerned, the name for the local administrative centre or Christian mission to which the people would come from the surrounding villages to supply objects.
It seems unlikely that Groenvelt made any significant excursions into settlements beyond those administered by colonial authorities or missionaries and he did not record the names of the settlements from where vendors brought objects. This may account for the attribution of the Mountain Ok shields to May River as it is possible that he obtained them at the patrol post there.

with. Written on their tags were the name J. J. Lind and the attribution of Dera tribe. This material was of particular interest because up to this time we had no material from this group. Dr Kees van den Meiracker found the name 'Jamar Nainda' [=Yamamainda] on the database, which is in the Dera census division (Bourke et al. 1993). Lind was a district officer administering people speaking Waris and Jafé languages around the Keerom River on the Dutch side of the border. Lind led the final Dutch patrol into the Dera enclave that Miles was to visit three years later and the objects were collected during this patrol. Twelve pieces were collected by Lind within the enclave and come from the villages of Kamberatoro, Tamarbek, and Yamamainda, with one other object coming from the village of Waris on the Dutch side.

It is now apparent that Lind also made patrols into the Waina and Waris areas however I have yet to establish whether collections were made in these areas. I have not located any additional pieces from this region in the other major Dutch museums holding New Guinea collections. While Lind's collection is small, the objects are distinctive and demonstrate strong cultural similarities between the Dera and their neighbours, the linguistically-related Anggor and the Yuri. The patrol report written by Lind (1962) is held in the Algemeen Rijksarchief (General State Archives) in Den Haag and a copy is held by the Arsip National in Jakarta.

One of the most fascinating discoveries occurred during my final week at the RMV in Leiden after I came across a number of arrows with attributes identical to some from the southwest region of the USB. Their accession numbers indicated that they were acquired significantly earlier than the other material. The only information supplied in the register was the name 'Gjellerup'. Barry Craig correctly assumed that the collection was made during the Dutch-German border expedition of 1910. The collection manager Sijbrand de Rooij obtained a copy of the expedition's report from the Leiden University Library and it revealed that the objects had been collected by the Danish botanist Knud Gjellerup, who was also the chief medical officer of the expedition.

Soon after the report had been uncovered we obtained copies of the 1911-1914 minutes of the Batavian Society of Arts and Sciences (Bataviaasch Genoottschap

van Kunsten en Wetenschappen 1911-1914). The Society had the responsibility of conserving scientific and cultural material housed in the colonial museum in Batavia. The minutes revealed that Gjellerup had despatched an extensive catalogue to the Batavian Society together with 628 objects. Some of these pieces then entered the RMV in 1914 while the rest appear to have remained in Batavia until Indonesian Independence.

The total number of pieces from the 1910 expedition held by the RMV appears to be around fifty. Some of the pieces I recorded were clearly from the study area but without the Gjellerup catalogues it is impossible to accurately place the objects. The report details the location points of bivouacs for both the Humboldt Bay and Sepik sectors and it is likely that the Gjellerup catalogue would have noted the bivouacs where objects were collected as was the case with the Schultze-Jena collection in Berlin. That the catalogue has two volumes suggests that the material is well documented.

During my final days in Leiden, I met with Dr Pieter ter Keurs, curator of the Southeast Asian collections at RMV. He had recently curated an exhibition that included many objects from the Indonesian National Museum, Jakarta. Dr ter Keurs claimed that there were many pieces from the PNG side of the border in the Jakarta museum and that the staff at the Museum did not know their origin. It is possible that these originated from collections once held in the old Batavia museum.

In other cases, additional collections were brought to light through publications or correspondence with anthropologists or curators. One such example was the small Baktamanmin collection made by Frederick Barth. I was informed about it by Maria Friend. It is held at the museum of natural history and ethnography attached to the University of Bergen in Norway. When I arrived at the museum, a large part of the collection was on display and the objects were positioned on and alongside two mannequins representing a Baktamanmin man and woman. As it happened, this exhibition was a downsized version of one set up with the assistance of Barth in the late 1970s in the Museum of Cultural History at the University of Oslo. During the early 1990s, the collection was transferred to Bergen, where much of the diorama-like set and content of the exhibition was retained. I was given permission to record,

photograph and measure the material in situ and in doing so remove the objects from the glass cases and mannequins if necessary. The material not on display was not numerous and was housed in two wooden boxes. I was able to complete the documentation in the museum's laboratory and photographic studio.

The list of accession numbers I found accompanying the collection notes indicate that 96 objects were registered at Bergen in 1994. After recording the objects on the floor and in the store, however, I found that forty-four objects from the accession sheets were missing. Store records revealed that these items were not officially recognised as being housed in the museum and if they were in Bergen they were probably in a location external to the museum. The location of the forty-four pieces remains a mystery. I was lucky to hunt down a photograph of the old exhibit in Oslo and noticed that not only was the exhibit larger than the one in Bergen but there were changes; for example, the Baktamanmin woman in Bergen held a bark cloth over her head and shoulders; in Oslo she carried a heavy duty string bag of taro tubers. It is clear that her hands had been modelled for the bag but its present whereabouts is unknown. Farideh Faramarzi, Collection Manager at the Museum of Cultural History, University of Oslo, confirmed that the entire collection was sent to Bergen. Unfortunately, none of the people who were working at the museum during the period when the collection was acquired were still employed there.

By far the most important additional body of material, as far as the present project is concerned, was identified and recorded in Basel at the Museum der Kulturen. The original target was the Eliptaman collection of Gisela and Meinhard Schuster but their Mianmin material was unknown to me. There was also a collection from Yellow River, made by Alfred Bühler, an ethnographer well known for his collections from the Admiralty Islands, Middle Sepik, and other areas of the south-west Pacific (Ohnemus 1996). Bühler made his Upper Sepik journey in the late 1950s, specifically to collect for the Museum.

When Bühler's Yellow River collection was identified an unfamiliar term, 'Sibat', was entered next to a few of the accession numbers. There was also a significant number of Abau shields, some collected by Craig but also some collected by Bühler that appear to be from further up the Sepik. The only geographic attributions for

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these shields were either 'Yellow River' or 'Green River'. However, there was one with the name 'Kobararoo' written on an attached label. This shield's type was undoubtedly Abau and 'Kobararoo' was obviously a reference to the village Kobraru which is well to the western part of the Abau territory.

I assumed that Bühler had proceeded up the Sepik from Yellow River to Green River. But this was not confirmed by the Bühler collection files from the museum archives or by Bühler's field notes. Christian Kaufmann, retired curator for the Oceanic collections, determined that Bühler had gone no further up the Sepik than the mouth of the Yellow River and, after a failed attempt to go up the Yellow River, returned to May River (Bühler 1959: 47-48). Therefore the Green River shields must have been obtained elsewhere.

Bühler provided a map that places Sibat on the north bank of the Sepik, a little downstream from the mouth of the Yellow River. This was a recently established riverside settlement, positioned for the convenience of administration patrols. Christian Kauffman and Barry Craig agreed that this riverside village must be the Namie settlement of Tipas, relocated from a position about six kilometres further inland. In his notes, Bühler stated that it was impossible to buy or find shields in Sibat, the only Namie village he visited. Thus it appears that, as with the Abau shields, the Yellow River shields were also collected elsewhere. One of these was published by Schuster (1968-69, Abb. 30) with the attribution 'Maui, May River'. This is an Iwam village about eight kilometres downstream from the mouth of the May River. It is possible, therefore, that the Green River and Yellow River shields were taken to Maui for sale to passing foreigners.

7.3 Problems with provenance

During the data collection process, there were often problems in tracking down sufficient documentation and provenance for the objects. For many early, small collections, a lack of detailed information was understandable due to the haphazard nature of the collection process itself. But there were other instances where the absence of such information was surprising. The most significant example was the collection made by members of the Dutch Star Mountains Expedition of 1959, now held at the RMV in Leiden.

Prior to my arrival at the RMV, I had little knowledge of the extent or quality of the collection notes held at the museum. The paper written by Koojiman (1962) made me apprehensive as to whether a sufficient level of information existed. It turned out that the only collection notes and object descriptions were those written on catalogue cards held in files in the curatorial office of the Pacific collection. This information had been collated from the field notes and memories of the expedition members and contained no additional information beyond that included in Koojiman's paper.

The original expedition field notes are held at the Royal Dutch Geographical Society in Utrecht. I contacted Dr Paul van den Brink, Geographical Sciences, University of Utrecht, and Arnold Wentholt, archivist for the Society. Wentholt kindly reviewed the field notes, including those of anthropologist Jan Pouwer, and found no reference to specific objects. Wentholt's impression reflected that of Kooijman: it seems that most of the objects had been brought to the expedition's bivouacs from the nearest villages and enhanced by what members of the expedition brought back from short field trips. Unfortunately, the collectors had even neglected to note the bivouac at which objects had been collected.

7.4 Museum registration and documentation problems

One of the most rewarding aspects of the project was the opportunity to visit the various museums that house the material. These visits allowed me to meet a number of interesting and learned individuals, many of whom went out of their way to support this project and recognised that the best way to enrich and preserve collections is to make them accessible for research.

While in most European and Australian museums there is a strong focus on the preservation of collections, many problems reflect the museums' constant struggle with shortages in staff and resources. While these cuts were to some extent alleviated by the adoption of electronic technology, I was surprised how few museums had yet to develop electronic record systems and where they had, many documentation problems had got worse. The loss of curatorial expertise and corporate knowledge meant that data transferral was often accompanied by

misinterpretation and lack of appreciation of the importance of field collecting numbers, which at several institutions were removed once accession numbers had been given!

Data loss in museums was also significant. I have already referred to the collection, made during the Miles and Cameron expedition, at the Australian Museum in Sydney. Although Miles informed me that he had provided village names for each object collected, the register only provided the name of administrative sub-districts. The Upper Sepik collection was divided into two parts; 350 objects were attributed to the Green River sub-district, and 200 objects were attributed to the Amanab sub-district. No collection notes or field notebooks could be located in the museum's archives.

The problem of keeping track of collections and their documentation, through years of changes in personnel, storage location and museum practice is one that faces all museums. Another example of how documentation can be lost, and can cause significant problems for curators and researchers at a later stage, confronted me in the Netherlands. The RMV was one museum that had provided electronic worksheets prior to my arrival but, as was common with most museum databases, there had been no entries for the original field numbers. Fortunately, museum staff located a document that reconciled accession numbers with the relevant field numbers. While this document included all of Craig's 1969 objects, many of the pieces from his 1968 collection were missing from the list.

On my arrival in Leiden I found no trace of the missing 1968 objects or related documents. Then in the collector files I discovered an old typed list of the full 1968 collection where each of the entries for the missing objects had either the letter 'A' or 'R' written next to them. I pointed these out to the collection manager, who soon determined that they stood for 'Amsterdam' and 'Rotterdam' and subsequently identified them as representing the Tropen Museum in Amsterdam and the Wereld Museum in Rotterdam. It seems as though there had been a practice at that time of sharing some of the larger ethnographic collections with related national institutions.

This document, of which there was only one copy, proved to be extremely valuable because when I paid a visit to the Tropen Museum in Amsterdam, I found that the field numbers had not been recorded at the time of acquisition and many of the field number tags had fallen off. However, village attributions had been recorded in the register, possibly extracted from other documents that had accompanied the material from Leiden, and I was able to reconcile the field numbers with the objects.

While some attrition of collection notes and records seems to be unavoidable, there have been cases where the systematic neglect of field notes and collection notes has affected the ability of a museum not only to identify its collections but to maintain effective collection management. The most extreme case of such a situation existed at the PNGNMAG.

Prior to arriving in Port Moresby I had entered a considerable amount of data for the objects from a copy of the National Museum's register held by Barry Craig. During this process I had discovered significant problems with the register's entries and was eager to access original collection notes when I arrived. I immediately searched the filing system for collection notes, which had been set up in one of the stores, and looked also in the museum archives, library and the curatorial department's document storage systems. What became evident was that no collector notes, from collections made prior to the relocation of the museum to its new building in 1977, were housed in any of these locations. This was a major concern because almost all of the material relevant to our study had been collected prior to that year. The director, Simon Poraituk, the collection managers and curatorial staff had no recollection of any collector notes from this period ever being held in the museum. Several researchers have said they supplied collection notes so it seems that these have been lost. In some instances, copies of these notes were identified in other institutions or obtained from the collectors themselves.

This lack of recognition of the importance of documentation has affected the quality of the registration of collections ever since 1975. At the declaration of Independence in 1975, a new registration system was put in place that allowed for considerably more detail to be recorded than was the case prior to then. However, by the late 1980s it seems that this more arduous system of registration defeated the enthusiasm

of the people doing the registration and a temporary registration system that provided only the name of the collector and a brief summary of the collection was resorted to.

An electronic database was established during the 1990s but by 2005 it had fallen out of use or into misuse. Where information had been entered it was even more limited than that provided by the temporary register and incorporated new errors. By the late 1990s, the amount of incoming material had overwhelmed the museum's capacity to register new objects and the registering of objects and cataloguing of collection notes ceased.

Documentation became detached from the objects and so objects with problematic or no provenance were given temporary numbers called a 'no number' (NN) number. Objects so 'registered' were then placed in the store according to functional class. As the secondary criterion of location of objects in the stores was according to geographic region, it meant that staff had either to create a space within each of the four storerooms for NN material or to give an object a putative cultural/geographical attribution. Examples of both strategies were common and in many cases the attributions appeared to be wildly inaccurate.

To make things worse, collections were sometimes not accessioned in their entirety. For example, three attempts had been made to register Bryan Cranstone's collection since 1965, the last attempt being in 1983.[35] Sometime in the 1990s, forty-one Cranstone arrows, housed on a rack dedicated to arrows of unknown origin, were given NN numbers even though some still had Cranstone's field number tags attached. It is apparent that by the time of the last attempt to register Cranstone's collection, the staff had little or no knowledge of the history of the collection.

For some time, it seems that the only motivation for registration of material was to get rid of a backlog, to make space for incoming material. Finally, the NN system became overwhelmed and collapsed and the registration space in the stores became congested. To resolve this situation, staff devised a system of 'overflow drawers' to

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[35] 16 Cranstone objects still remain unregistered.

store objects prior to their being registered or given an NN number. I identified some pieces relevant to our study in these drawers through tags and the handwriting of the field numbers. For most incoming objects, however, the only place left was the floor and most pieces were placed on top of plastic sheets, leftover material from the manufacture of thongs, tarpaulins, or the bare concrete. In two stores, objects carpeted much of the floor and after I investigated these piles for missing objects it became apparent that the vast majority of them entered the museum after 1990. Only a few older pieces had made their way back onto the floor, probably to make space for the repositioning of registered objects within the storage racks.

Luckily most of the pre-1990s material was still in the correct storage spaces allocated during the late 1970s and early 1980s. There were, however, a substantial number of registered objects missing: out of the nearly 3000 objects from our study area that were identified in the register, over twenty percent could not be located, even after numerous sweeps of the building and, as many of these pieces were collected before 1977, it is possible that many of them never made it to the new museum building.

Another problem I had to contend with was erroneous entries in museum registers. Hastily written notes with poor handwriting and inconsistencies in collector's field notes exacerbated many of these problems and obviously frustrated museum staff, especially where collectors used particular modes of abridging or coding. Given the considerable time and effort needed to resolve this kind of problem, it is not surprising that there were many errors and omissions of important data. Often ID fields were inexplicably left empty and information was inappropriately dittoed after a point in the registration process. It was also clear that in some museums object identification and provenance were considered less important than functional and aesthetic appraisals.

7.5 Discussion

The anticipated total of objects at the start of the project was approximately 8,200. At the closure of the data collection process I had photographed and recorded over 11,000, even though numerous objects could not be located. But of the 11,000, only 8,414 were provided with collection point data; around twenty-five percent had

either been lost, or had never been supplied with, provenance. This is quite alarming and suggests that one should be prepared for a considerable discrepancy between projected and realised outcomes when planning such an exercise. Importantly, however, the data collection processes used in this study enabled several collections to be identified and reconciled with their original collection notes. The value of these kinds of collaborations to the museums that hold these collections should not be underestimated.

8. Material Culture

8.1 Introduction

Around 11,000 objects, collected between the 1930s to the 1980s are included in the project's larger dataset and of this number approximately fifty five percent are from the USB and Border Mountains and forty five percent from the highlands of CNG.[36] The collection came from 237 settlements/location points across the study area. These are given in Table 8.1 according to their language attributions and shown in Map 5 (Appendix 6).

The collections that make up the sample, the approximate number of objects they hold, and the museums in which they are housed, are given in Tables 8.1 and 8.2.[37]

The sample includes all manner of objects from the most basic utilitarian tools to highly elaborate paraphernalia used in ritual. Many utilitarian classes are common throughout the study area because of regional similarities in hunting, gathering and horticulture. These include readily made items such as diggings sticks, bamboo knives and fire tongs to technologically complex items such as stone adzes and looped string bags for transporting staples (Appendix 10 and 20). Throughout the study area there is also little in the way of clothing. The woman's skirt, of which there are various forms, is the major form of clothing in the study area, but in CNG a type of bark cape may also be worn by women for protection against wind and rain (Appendix 11). The men, on the other hand, can be considered to have no form of body covering other than the phallocrypt, which functions simultaneously as a protective device and a form of ornament or insignia (Appendix 6).

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[36] Additional information concerning the material culture, including photographs and an overview of the distribution of some forms can be found on the website: http://uscngp.sai.net.au

[37] These figures are approximate because some registered objects have as yet to be located, some objects identified as belonging to the collection had yet to be registered, and a number of objects identified as belonging to a specific collection have yet to be corroborated.

Table 8.1 Table for settlements/location points at which the sample was collected

Language	Settlements
ABAU	Abaru, Ambremaki, Antibi, Baio, Baiwai, Bambledjam, Beimap, Biaka#1, Bibiyun, Bifrou, Bisiaburu, Bof, Buna, Buriap, Dieru, Esyu, Hogru, Hufi, Iaburu#1, Iburu, Isagu, Isu, Keiseiru, Kobraru, Mahani, Miniaburu, Mukwasi, Otwilimakom, Selelian, Wagu, Wiro
AK	Kwieftim (The settlement Amer, shown close to Kwieftm on the map, existed in 1930s data and was most likely a settlement of ancestors of the present Kwieftim population)
AMANAB	Akraminag, Amanab, Aurump, Bapi River, Bipan, Einokneri, Iafar, Ivieg, Kwofinau, Nai#2, Naineri, Wamuru, Wofneri
AMTO	Amto, Sisilo/Amto, Waia
ANGGOR	Akrani, Baribari, Merewe, Nai#1, Samanai, Tengirabu, Udupai, Wamu
AWUN	Dabrau, Nigre
BAIBAI	Yebdibi
BIAKA	Amini, Biaka,
BIMIN	Bimin, Fagobip, Gapka, Kasanmin, Kwermin, Senganabip
BUSA	Busa, Rawei
DERA	Tamarbek, Yamaminda
FAIWOL	Baktaman, Bolang, Bolovip, Gamanfolabip, Golgulbip, Imigabip, Katokabip, Momdangabip, Olsobip, Selbang, Seltaman, Wogembip
KAUWOL	Alabip, Kowalabip
KWOMTARI	Baiberi, Guriaso, Kwomtari, Mango, Mufuara, Petaineri, Yau'uri, Yenabi
MIANMIN	Amaromin, Boblip, Kometen, Mabwaimin, Sokaten, Temsap, Tibip, Ukdabip, Usage, Usaliten, Wameimin, Yominbip
NAGATMAN	Dila, Marakwini, Nagitman, North River, Tila
NAMIE	Aiendami, Akwom, Alai, Aukwom, Bapi, Edwaki, Mukudami, Nami, Naum, Norambalip, Pabei, Panewai, Tipas, Wakau, Walakori, Yaru, Yawari, Yegarapi, Yibiri, Yiwani
NGALUM	Alalbil, Banolbil, Betabip, Bon River, Denmatta, Isipdin, Kigonmedip, Molbakon, Sibil Valley, Tumabip
OKSAPMIN	Aurap, Betiana, Divanap, Gaugutiana, Kweptanap, Menmaka, Mitaganap, Oksapmin, Tekap, Teranap, Tomianap
TELEFOL	Afogavip, Agamtewip, Angkevip, Asitavip, Awungkaman, Balantavip, Biltevip, Bogalminavip, Bolbil, Dalduvip, Daltigin, Demidubip (Urapmin), Demidubip (Falamin), Denbil, Denobip, Derolengdam, Dilidubip, Eliptaman airstrip, Falamin airstrip, Falamtikin, Feramin airstrip, Fliapbil, Fumukavip, Ibatigin, Igimduvip, Ilitevip, Ilivip, Imfumavip, Inangtikin, Kamobip, Katobip, Komdavip, Mimtikin, Misinmin, Namalavip, Nelenabip, Okfekaman, Oksivip (Kubrenmin), Sepkialikmin, Simintevip, Tagatemtikin, Telefolip, Terapdavip, Tinkabanabip, Ubtemtikin, Ulapmin, Yogavip
TIFAL	Asegavip, Behrmann Range, Biskimdum, Blemtalavip, Brolemavip, Broselavip, Brununbil, Bultem, Danavip, Demavip, Dimansigin, Dongbilabip, Magalsimbip, Mitultemun, Moiyokabip, Mongding, Namindumavip, Ogdibavip, Oksivip (Damalmin), Sogolmik, Tabok, Tifalmin, Tulkarmin, Tumolbil, Uguguvip, Wokbil
WAINA	Punda, Sowanda, Umeda, Waina
YURI	Auya#1, Auya#2, Fongwinam, Kambriap, Pananggan, Troli, Usari, Yuri#1, Yuri#2

Table 8.2 Collections from the USB/Border Mountains and the museums in which they are held.

Collector	No. of objects	Year	Museum repository
Bühler, A.	190	1959	Museum der Kulturen, Basel (Bas.)
Craig, B.	1120	1968, 1969, 1972-3	PNG National Museum and Art Gallery–PNGNMAG, Waigani (PM)
Craig, B.	680	1968, 1969	Australian Museum, Sydney (AM)
Craig, B.	680	1968, 1969	Ethnologisches Museum, Berlin (Berl.)
Craig, B.	680	1968, 1969	R.v.Volkenkunde-RVM, Leiden (Leid.)
Eve, H. D.	320	1938	Australian Museum, Sydney (AM)
Gerrits, G.	170	1972	PNGNMAG, Waigani (PM)
Huber, P.	140	1970	PNGNMAG, Waigani (PM)
Juillerat, B.	255	1973-1974	Museé du Quai Branly, Paris (Par.)
Juillerat, B.	255	1973-1974	PNGNMAG, Waigani (PM)
Kelm, A.& H.	450	1970	Ethnologisches Museum, Berlin (Berl.)
Kelm, A.& H.	75	1970	PNGNMAG, Waigani (PM)
Lewis, M.J.	85	1963	South Australian Museum, Adelaide (SAM)
Miles, D.	550	1965	Australian Museum, Sydney (AM)
Peter, H.	750	1969-1974	M.f.Völkerkunde, Vienna (Vien.)
Peter, H.	85	1969-1974	PNGNMAG, Waigani (PM)
Peter, H.	150	1969-1974	Göttingen University Museum (GUM)
Peter, H.	70	1969-1974	Museum der Kulturen, Basel (Bas.)
Schuster, M.& G.	205	1965	Museum der Kulturen, Basel (Bas.)
Womersley, J.S.	100	1949	South Australian Museum (SAM)
Miscellaneous	100	Various	Various
TOTAL	c.6855		

* Abbreviations in brackets will be used to identify origin museum in object photographs

Table 8.3 Collections from CNG and the museums in which they are held.

Collector	No. of objects	Year	Museum repository
Barth, F.	90	1968	Bergen University Museum, Bergen (Berg.)
Campbell, S.	125	1935-6	Australian Museum, Sydney (AM)
Craig, B.	320	1964	Australian Museum, Sydney (AM)
Craig, B.	120	1972	PNGNMAG, Waigani (PM)
Craig, B.	85	1983	PNGNMAG, Waigani (PM)
Cranstone, B.	490	1964	British Museum, London (BM)
Cranstone, B.	300	1964	PNG National Museum, Waigani (PM)
Star Mtns Exped'n	480	1959	R.v.Volkenkunde-RMV, Leiden (Leid.)
Eggertsson, S.	86	1994	Personal collection, Reykjavik, Iceland (Eg.)
Friend, M.	160	1981	British Museum, London (BM)
Friend, M.	200	1981	James Cook Uni. Museum, Townsville (JC)
Hyndman, D.	100	1971	Queensland University Museum, Brisbane (QUM)
Hyndman, D.	70	1971	PNGNMAG, Waigani (PM)
MacKenzie, M.	110	1982, 1984	Australian Museum, Sydney (AM)
Morren, G.	100	1969	Personal collection, New Jersey, USA (Morr.)
Morren, G.	105	1969	PNGNMAG, Waigani (PM)
Perey, A.	255	1967	PNGNMAG, Waigani (PM)
Poole, J.	100	1971	PNGNMAG, Waigani (PM)
Schuster, M.	480	1965	Museum der Kulturen, Basel (Bas.)
Wheatcroft ,W.	90	1969	Penney Collection, Lockport, NY, USA (Penn.)
Williams, W.	450	1935-6	LA County Museum, California, USA (LACM)
Miscellaneous	200	Various	Various
TOTAL	c. 4095		

While there is little in the way of clothing there is a significant assemblage of body ornaments and personal items. These may require minimal manipulation of locally collected materials or be intricately fashioned from such things as feathers, seeds, bones, dogs' teeth, pigs' tusks and shells. Where such ornaments consist of valuable and exotic items such as teeth and shells, they were sometimes used for marriage

payments. It is also important to note that the foundation for many body ornaments is provided by looped string bands made by women.

Two important personal items included the smoking-gourd and bamboo smoking tube and these important items were crafted locally and used by men for the consumption of tobacco throughout the study area. The other important piece of apparatus for intoxication was the lime-gourd for carrying lime used in chewing betel nut. These were ubiquitous throughout the lowlands and were also crafted locally (Appendix 13).

As for musical instruments, hand drums and jaw harps were found throughout the study area. Hand drums are hourglass-shaped and made from immature tree trunks that have been hollowed with the use of embers and gougers. Their distal ends are decorated with carved and painted designs and their tympana are made of lizard skin tuned with wax knobs (Appendix 14a). The only other musical instrument of significance is a wooden trumpet found in some parts of the USB and the Border Mountains (Appendix 14b). While hand drums and trumpets were used by men during ceremonies, jaw harps, made from a short section of bamboo, were usually played by men and boys during times of leisure. Slit gongs were found in some Sepik River communities in the USB but they were relatively uncommon and probably derivative (Craig 2002: 2).

Apart from the bow and arrow, carved and painted wood shields were used in warfare throughout a large part of the region. They ranged in size and shape and were used to provide a defensive shelter from arrows and never to parry (Beran & Craig 2005: 75-77; Craig 1967; 1970; 1976; 1988: 31-44; 2005b: 117-126; Appendix 15). Where the shield was absent, especially throughout the Border Mountains, the cuirass (rattan body armour) was used for protection (Tiesler 1984; Appendix 16). In CNG some groups used both shields and cuirasses.

As far as the visual arts are concerned, the region lacks the figural traditions and the monumental architecture and sculpture found in the lower and middle Sepik regions. The decorative programs of the study region are predominantly geometric and are carved and painted with mineral and organic pigments. The most significant

media for decorative art in CNG are the hand drums, shields, and the architectural façades (house boards) with designs similar to those of the shields (Craig 1970; 1988; Cranstone 1967; 1968; Appendix 17).

The other important painting tradition is found for masks used in sickness-curing and sago-fertility rituals performed in the USB and Border Mountains. Masks sometime consist of flattened sheets of sago petioles or coconut palm fibre, painted with a range of natural pigments and attached to conical frames constructed of bamboo or rattan (Appendix 18a-c). In the Border Mountains, the designs tend to be more figurative than those in the lowlands (Juillerat undated; Juillerat 1992b: 27-42; Gell 1975: 174-75; Gell 1992: 130-131). Other forms of decorative art can be found on arrows, gourd phallocrypts, gourd lime containers and bamboo smoking tubes. These were either pyrograved or incised with vaguely figurative or geometric patterns and stained or painted with organic and mineral pigments (Craig 1988; 1990; 2005c; Appendix 19).

8.2 Two classes of objects selected for analysis: string bags and arrows

Two classes of object – arrows and string bags – were chosen for analysis. There are a number of reasons for this choice. Firstly, they are ubiquitous for the study area. Secondly, they are crucial to the most important activities undertaken by men and women: gardening, hunting and fighting. Thirdly, arrows and string bags have great cultural significance (Gell 1975: 142-43; Jorgensen 1981: 68; MacKenzie 1991: 39, 142):

- Whenever a man leaves his settlement, he will carry his bow and arrows, and both men and women usually carry a personal string bag during daily activities;
- both are significant in ritual contexts;
- they are commonly recognised as signifying and expressing the social status of individuals who own them.

Fourthly, they are the most significant material expressions of each gender's modes of craft production because they are the most structurally and technically complex and diverse forms found in the region. Their manufacture is labour intensive and a

single example may have a number of features, each of which requires different skills to complete. They are also often highly elaborated, either with intricate arrangements of applied materials, such as feathers, shells, or seeds, or with patterns carved into the heads or foreshafts of arrows, or looped into the fabric of bags using string dyed with natural pigments.

As they were exclusively made by either men or women, the conceptual and technical qualities apparent in these objects reflect the different social prerogatives and transmission paths of each gender. However, it is important to note that men and women sometimes contributed additional elements to the other gender's craft. Women, for example, contribute string or looped string bands that secure the bamboo arrow blades to the foreshaft or hold in place the feathers or pig hairs that decorate the arrows; men, on the other hand, create the feather and pigtail arrangements for their insignia and hunting bags (MacKenzie 1991: 111ff, 196).

8.2.1 String bags

Throughout the study area, the creation of string bags is the primary objective of the craft of looping. It provides a flexible and portable container for which there is no comparable substitute. Some bags are specifically made to carry garden produce, firewood and babies. Others are designed to hold smaller, more personal possessions such as tools, smoking tubes and, in the lowlands, betel nut chewing paraphernalia. The smallest range of bags are a form of amulet containing magic charms worn to provide success in hunting and gardening, to cure illness or even to secure a sexual partner. Considering this diversity in function, it is not surprising that string bags account for a considerable range of attribute variables and, while some of their characteristics are not immediately discernable, a great range of techniques are used to achieve their formal and structural properties.

The technical and functional diversity of string bags has led to a vast array of shapes and sizes, often further amplified by an active objectification of crucial features (Appendix 20). The resulting combination of forms, textures and decorative elements has resulted in what MacKenzie (1991: 14) has deemed 'a convenient medium' to express and convey an individual's identity, both within and outside the community.

MacKenzie has drawn attention to the manner in which knowledge of these technical features is transmitted and perpetuated through generations of women, enabling a group to establish and maintain traditional forms. The transmission of a full repertoire of string bag techniques is often a long and drawn out process; women learn progressively and only develop a proficiency in the majority of these techniques over their lifetime. Their tutelage begins in early childhood when they are taught basic skills by their mother and may continue into adulthood when they are able to learn from a select group of highly skilled older women who are privy to the most complex of techniques (MacKenzie 1991: 105). This somewhat restrictive avenue of transmission has contributed to the emergence of localised traditions of string bag technology as girls are largely directed towards adopting a particular set of traits involving a long period of tutelage. It is therefore no surprise that a girl who marries into some other group seldom has the opportunity to develop the techniques common to her natal community and will adopt many techniques belonging to her husband's community (MacKenzie 1991: 104).

All string bags within the study area are constructed with hand-spun string made from the treated inner bark (bast) of saplings. In the lowlands, fibre from the bark of the tu-lip (*Gnetum gnemon*) is reported as being the most commonly used material (Kelm & Kelm 1980: 178; Kooijman 1962: 21), although *Phaleria* sp. has been reported for some groups in the Border Mountains (Juillerat undated). In the highlands, the fibre comes from the bark of species belonging to the genus *Ficus* (Hyndman undated; MacKenzie 1991: 69-70). It is important to note, however, that MacKenzie observed that by the 1980s, the Mountain Ok had come to use tu-lip fibre which had to be sourced from the lowlands; its elasticity and softness means that it is stronger, easier to spin and loop, and provides a more pleasant texture (MacKenzie 1991:71). A comparison of bags in the study sample whose fibre source was identified, revealed that bags made from tu-lip fibre were significantly different in texture to those made of *Ficus* fibre, a difference that was generally apparent between bags from CNG and the USB, suggesting sourcing of tu-lip by women in the highlands was relatively insignificant in the time when the majority of the collections were made.

Before the spinning process, the bast is either treated by smoking or by soaking in water for a period of time. In the lowlands the bast is sometimes beaten and prepared by men; in the highlands the women treat and shred the bark (Kelm & Kelm 1980: 178; MacKenzie 1991: 73-74). A woman then chooses an appropriate length of fibre which she twists with the flat of the hand on the upper thigh. She first twists each strand singly in an S-direction (down the thigh) and then twists them around each other in a Z-direction (up the thigh) to create a strong two-ply thread (Kelm & Kelm 1980: 178; MacKenzie 1991: 78-79).

Across the study region, there are numerous techniques used in the looping and construction of string bags and local preferences for particular techniques have been observed by fieldworkers (MacKenzie 1991: 34-35). Maureen MacKenzie's fieldwork in CNG, and her subsequent dissertation and publications (1990; 1991), remain the most comprehensive body of work concerned with the description and assessment of string bag traditions within the study area and it is she who first identified the comprehensive set of techniques that are used in making such bags. Some of the characteristics that MacKenzie identified as diagnostic of particular group preferences include:

- nature of components found on bag (e.g. mouthbands, edgings and strap types);
- method of construction (looping methods) and co-joining;
- shape and structure of bag.
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The range of styles used in the adornment and embellishment of string bags throughout CNG have also been described and assessed by MacKenzie (1991: 111ff). As noted above, there was a far greater tendency in CNG than in the Upper Sepik for men to decorate string bags, and not only their own bags, but also the bag of a son or a nephew about to go through one of the earlier stages of initiation. The decorations used feathers of particular birds with symbolic attributes that differentiated the various stages of male initiation (Barth 1975: 161; MacKenzie 1991: 170). Some bags from the lowlands were given feathers but these adornments were not ritually significant and such bags were commonly owned by women. Rather, string bags adorned with pigtails — sometimes in combination with

cassowary feathers — were the most socially important bag possessed by men in the lowlands as these signified a man's hunting prowess (Barry Craig pers. comm. 2005). In other cases personal bags were adorned with nuts, shells or seeds (Appendix 20f-14g).

There is no evidence that the Mountain Ok traditionally used any form of dye to decorate their bags but occasionally mineral pigments were painted around the mouth or body of the bag.[38] Often stripes resulting from alternating shade and colour are found in the bag's fabric but this feature was unintentional and resulted from variation between the different batches of prepared fibre.

In the lowlands, however, there was an extensive use of natural dyes; multi-coloured patterns are common for string bags intended for personal use. The method involves dyeing the string prior to looping, and forming the patterns by alternating the coloured string as the bag is looped (Appendix 20i-k).[39]

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[38] White was derived from decomposed limestone and the red is a type of ochre or ferrous compound (e.g. Craig 1988: 33).

[39] Some of the pigments that have been recorded for the lowlands include: the juice from the seed capsules of a small yellow-flowering plant *Cypholophus latifolius* (Awun: yi yeman), which produces a dark blue-green pigment (Kelm & Kelm 1980: 180; Juillerat undated); the fruit of the arnatto bush (*Bixa orellana*) is used for red dye (Kelm & Kelm 1980: 180); and *Melastoma polyanthum* has reported as being used for red/mauve dye (Craig 1973: supplementary notes).

8.2.2 Arrows

The degree of sophistication and diversity that arrow technology and morphology exhibits across the study area is understandable considering that arrows were, and in some cases still are, the principal means with which to both hunt game and kill people. The arrow's role in these foremost of men's activities, hunting and fighting, also determined that, more than any other object, the arrow was intrinsically linked with male persona and ethos (Barth 1975: 188). Thus the consideration of an arrow's form went beyond a basic concern for performance. The degree of attention and effort that men dedicated to the creation of arrows meant that fine examples were acknowledged as works of great craftsmanship (Craig 1988: 47; Jorgensen 1981: 68; Morren 1986: 272-3). High quality arrows conferred prestige on their makers and owners and were readily sought out by men, being frequently traded and gifted between men from different communities although there is no evidence to suggest that arrows were made specifically for ceremonial purposes as is the case for some parts of New Guinea (Bush 1985: 257; Cranstone 1990: 38; Jorgensen 1981: 69).

While there is considerable morphological diversity within the sample, arrows can be divided into functional sub-classes, most of which are ubiquitous to the study area (Appendix 21a-c). Arrows that are designed for pigs, cassowaries and humans differ from those made for lesser prey in that they are larger, they are usually decorated, they have more complex heads or blades (e.g. the pattern of barbs of fight arrows) and they are made to be more durable and reliable as opposed to arrows designed for lesser prey which are to a greater degree expendable (Bleed 1986). Otherwise, arrows designed for marsupials and large birds are analogous to those made for pigs, cassowaries and humans.

Arrows have two or three structural components:
- the 'head' or 'blade' that varies in size and shape according to the prey and the type of wound intended;
- a foreshaft or other means of adding weight to arrows with bamboo blades;
- a shaft.

Arrows were not equipped with fletching to assist the arrow's flight; instead, they were long and weighted towards the tip. The most commonly used methods of weighting bamboo-bladed arrows involved either:

- using a foreshaft made from palmwood,

- binding a small stone to the base of the arrow blade, or

- applying a paste made from marl or lime and various plant resins to the binding when joining the shaft to the head (Juillerat undated; Kelm and Kelm 1980: 67).

Arrow shafts are made with a cane from reeds or sword grass.[40] Arrow shafts are cut to length according to the types of head that they will carry and the mode of weighting used. The arrowheads are usually attached to the bottom end of the reeds where the diameter is greatest (Kelm and Kelm 1980: 67). In the lowlands, lines or simple elongated patterns are sometimes scratched into the surface of the reed shaft (Appendix 21f). Kelm and Kelm (1980: 67 – translated by K. and M. Fyfe) provide the only information as to the purpose of such decoration:

> …..a simple geometric design is scratched into the bamboo [*sic*] stem between the nodes (Ak: paam; Men.: ketou; Auwon: apen) with a sharp stone, or today with a knife. The shaft is then rubbed with leaves (Ak: mekum oro; Men.: mauwo seroki) and finally turned slowly over a fire so that the scratched design becomes black. This process is of particular importance since the patterns confer magical properties. Arrows without patterns on the shaft miss the target. Since each hunter has his own lines, circles or spirals, the designs also serve as an indication of ownership.

Such 'shaft streaks' have also been reported for traditional arrows in North America and these also have been attributed with giving magical power to the arrow (Mason et al. 1891: 49).

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[40] the most commonly identified are *Miscanthus floridulus* and *Saccharum sp.* (Cranstone 1964b; 1990: 37; Kelm & Kelm 1980: 67; Hyndman 1979: 216)

Arrowheads were made of bamboo or a hard wood, typically one of the many varieties of palmwood that are grown in the lowlands and lower slopes.[41] The greatest amount of formal diversity is found on the arrowhead. Bamboo arrowheads are lance-shaped or blade-like and have cross-sectional tendencies that produce either a deep piercing or a gash-like wound.[42] Throughout the study area, bamboo bladed arrows were said to be for war, or for hunting pigs, cassowaries or other large game. Bamboo bladed arrows with thick, heavily beveled bamboo sections were invariably reported as fight arrows in the lowlands while sharp wide and open bladed arrows were more commonly reported as being intended for pigs and cassowaries. In the highlands, on the other hand, where thick, beveled bamboo-bladed arrows were uncommon, wide open blades were also reported as fight arrows.[43]

A feature of the bamboo bladed arrows from the study area is that sometimes barbs are cut into one or both edges of the blades. In the lowlands where barbs are more common on the bamboo blades, a section of a thorny variety of *Calamus sp.* is sometimes attached with bark fibre or string along the centre of the blade (Cranstone 1968: 610). Bamboo blades are also modified in two other important ways. One, they sometimes have enlarged 'shoulders' at the base of the blade. A discussion with colleagues led to the conclusion that this feature was probably intended to prevent the arrow blade from fully being imbedded in the intended prey and therefore these arrows were most likely for slaughtering pigs. The other form of modification involved shaping the blade in two sections presumably so the blade would snap at midpoint after entering the body and therefore leave a section in the body after removal. Most bamboo bladed arrows designed to be shot at pigs and humans are constructed with a palmwood foreshaft. Foreshafts are durable, unlike the shafts and bamboo blades, and may be passed down from one generation to the next.

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[41] Hyndman (1979: 216) provides the most comprehensive list for species of palmwood used by communities within the study region (e.g. *Hydriastele*, *Nengella*, *Caryota*).
[42] Sillitoe (1988: 134-144) reported similar tendencies in Wola bamboo bladed arrows and also observed that different varieties of bamboo were sometimes chosen for the different blade types.
[43] This is in keeping with Pétrequin and Pétrequin's (1990) observations concerning variability in what was considered appropriate fight arrowhead types across Dani communities in [West] Papua.

While bamboo-headed arrows include the greatest diversity in structure, palmwood-headed arrows include the greatest diversity in arrowhead morphology. Palmwood heads can comprise a simple tapering length of round or oval cross-section, or be carved with a range of barb forms and cross-sections. Barbs follow a range of tendencies. Sometimes the whole length of the head provisioned with barbs while some arrows have a series of just one or two barbs near the end. In other cases heads are incised so that the tips will break leaving a portion in the victim's body. Some tendencies in head modification are found throughout the region, demonstrating that people readily adopt new weapons technology when it is assumed to be advantageous — a kind of 'arms-race' to counter the emergence of a technological advantage in warfare, coupled with the tendency to associate prestige with the ownership of such weaponry.

Like the foreshafts of bamboo-bladed arrows, palmwood heads are often embellished with intricately carved and painted designs. These designs are usually structured a little differently to those on foreshafts, with the barbs forming part of the design (compare Craig 1995, Fig. 65 A and B to C, D, and E).

The third most significant class consists of palmwood-headed arrows with a detachable bone tip which were intended for human targets; these tips are intended to stay in the body once the arrow has been removed, to cause infection in the wound of the victim. This device is used in many parts of New Guinea; in some areas the tips were made from sections of human fibulae but more commonly cassowary spurs, or a long thin section of fibulae bone of the cassowary, wallaby or tree kangaroo (Sillitoe 1988: 145-151). In the USCNGP area, only tips made from fibulae are evident and the available data suggests these are marsupial fibulae (Kelm & Kelm 1980: 69).

A fourth class of arrow comprises multi-pronged forms that are used to kill small game, such as lizards, fish and birds (Appendix 21c). The prongs are commonly made of palmwood or bamboo, although local hardwoods are sometimes substituted for palmwood in parts of the highlands where palmwood is relatively scarce and has to be traded in.

There are two varieties of pronged arrows: one with a multitude of fine slithered prongs that are most commonly used to kill small fish and arrows with three to five prongs used most commonly on small birds. The latter are constructed from bladed sections of bamboo or tapering points of palmwood that are either plain or have small barbs.

The last distinct class of arrow is used to stun or kill small game, such as lizards or birds, without causing damage to the skin or pelt of the prey. These may consist of a carved conical wooden head, a more gnarled form made from a sapling root, or less often a section of animal bone, such as a pig vertebra (Cranstone 1964c).

The most important technical features used to unite and hold the various arrow components in place are the bindings. These are composed of strips of plant material that are braided, wound, or knotted over the joins of arrow components. Bush (1985) and Woolnough (1998) previously investigated some of the links between arrow bindings and linguistic affiliations among highland communities of New Guinea, including some arrows from CNG. While they were successful in demonstrating some correlation between arrow binding techniques and language, their work was hindered by the small numbers of arrows in their samples and an inadequate grasp of the different techniques of binding.

The number and position of bindings are determined by the structure of the arrows. The largest range of binding positions, and also techniques, are found on bamboo bladed arrows with foreshafts. These usually have at least two, and sometimes up to four, independent bindings that vary according to their function and their position on the arrow. There are also a range of possible binding types for each position and it is apparent that while variation in braiding, whipping or knotting technique is somewhat determined by cultural choice, the nature of the head, and the structure of the arrow determine the method of binding. For example, wide blades are more likely to be fastened with whippings of straight winds or alternating winding techniques. On the other hand, where narrower points and foreshafts are inserted into shafts, this juncture may be reinforced with the addition of a small braided ring that acts as a ferrule.

The material used for binding is to some extent determined by the binding technique. For example, bast and bast string are commonly used for whipping while pandanus leaf and, more commonly, rattan is used for braiding. Unfortunately, it has not been possible to undertake material analyses of bindings. Choice of arrow binding materials also differs somewhat over the study area and commonalities and differences in preference are found both between and within the highlands and lowlands. Highland groups were reported to use strips of pandanus leaves (Barth 1987: 70), orchid fibre (Bush 1985: 266), strips of rattan (*Calamus sp*., Cranstone 1964a-field notes; Hyndman 1979: 216; Kooijman 1962: 26), and bast fibre string made by women (MacKenzie 1991, Plate 110). In the lowlands, rattan was also commonly used; varieties such as *Stephania zippeliana* or *Cayratia sp*. have been reported being used in the Border Mountains (Juillerat undated). Bast fibre string was also in common usage in the lowlands and hills but, unlike the highlands, plain strips of bast, which men rather than women prepare, were sometimes used. These bast fibres are often used in combination with mineral and resin pastes to add weight to the arrowhead (Juillerat undated; Kelm &Kelm 1980: 67).

As already mentioned, arrows are carved and painted with distinctive and often elaborate designs (Appendix 20d-f). Designs are found on palmwood arrowhead, foreshafts, and bamboo blades, and decorated arrows are invariably well crafted and intended for use against pigs and humans. Designs carved into palmwood components involve the use of a small marsupial incisor, usually two of them bound between two pieces of wood (Craig 1988: 46, Illust. 31 C). For the paintwork, decomposed lime and ferrous compounds are used for white and red, while soot, and sometimes tree resin, is used for black.[44]

Finally, these highly embellished arrows are often also decorated with feathers or pig bristles at the base of the head or bamboo blade. The feathers used are from several species of birds but most commonly birds of paradise, cockatoos and cassowaries (Juillerat undated).

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[44] Juillerat (undated), reports sap from the New Guinea Kwila tree (*Intsia palembanica*) as being used in such a manner by the Amanab.

Section Four

9. The Languages of the study area

9.1 Introduction

An assessment of the study area's languages was undertaken by Martin Steer. He summarises (2005: 4):

> The languages of the upper Sepik and of CNG differ markedly in the character of their genetic relationships. The Sepik catchment exhibits a degree of genetic diversity unequalled anywhere in the world, with 200 languages belonging to perhaps as many as ten unrelated families together with several genetic isolates, and the upper Sepik has diversity commensurate with this. The CNG region, by contrast, is linguistically relatively homogeneous.

Sixteen languages are found in the USB and Border Mountains (see map, Appendix 4). The majority of these were originally assigned by linguists to three phyla (Laycock 1973; 1975; Wurm & Hattori 1981):

- Trans-New Guinea (Waina and Amanab of the Bewani Family and Dera and Anggor of the Senagi Family);
- Kwomtari (Fas and Kwomtari in the Kwomtari Family, and Baibai and Biaka in the Baibai Family);
- Sepik-Ramu (Abau constituting its own Family within the Upper Sepik Stock and Namie, Ak and Awun in the Yellow River Family/Stock).

Four languages were unclassified and considered to be isolates, unrelated to any other languages (Yuri in the Border Mountains, Nagatman and Busa in the Upper Sepik lowlands, and Amto in the West Range).

Recent linguistic research has called for revisions to the classification of these languages. Membership of the Senagi Family in the Trans-New Guinea Phylum has been questioned with suggestions that the Senagi languages are more likely to be distantly related to languages of the Sepik (Steer 2005: 18-19). Also Foley (2005) has questioned the integrity of the Sepik-Ramu Phylum and has regrouped the languages into two separate 'families' (Lower Sepik-Ramu and Sepik), this does not affect the grouping of the languages in our study area.

There are eight languages found in CNG (see map, Appendix 5). There have been no recent revisions of the classification of the languages of CNG, all of them belong to the Trans-New Guinea Phylum. The Ok Family of languages has been sub-divided into Mountain- and Lowland-Ok (Healey 1964), the former located in the central range and the latter inhabit the lowlands to the south, on the upper reaches of the Fly and Digul Rivers. The Mountain-Ok Sub-Family seems to fall into three groupings: the Ngalum in the west, the Mianmin in the north and the central and eastern languages of Kauwol, Tifal, Telefol, Faiwol and Bimin. Oksapmin is a Trans-New Guinea Phylum-level isolate in the extreme east of the study area.

Steer has provided the USCNG Project with a language matrix for the codification of language relationships (Tables 9.1, 2). The language relationships were constructed on the basis of shared cognates with some consideration of morphology and structure, and 'imply a relative chronology' (Steer 2005: 7-8; see also Laycock 1973: 70-71).

Table 9.1 Scale of linguistic relatedness for study area languages.

1.	Unrelated.
2.	Very distantly related (not enough putative cognates to establish sound correspondences or to reconstruct the phonological history or a protolexicon).
3.	Belonging to the same subgroup but extremely disparate, indicating at least 3000 years of separation.
4.	Belonging to the same subgroup and showing systematic similarities in numerous subsystems, indicating separation within the past 1500–3000 years.
5.	Belonging to the same subgroup and showing evidence of having been mutually intelligible as recently as 500–1500 years ago.
6.	Well-differentiated dialects of the same language.
7.	Little-differentiated dialects of the same language.

Table 9.2 Matrix of linguistic relatedness for study area languages.

```
Amanab
4   Waina
    _____
1   1   Baibai
1   1   2   Biaka
1   1   2   3   Kwomtari
        _____
1   1   1   1   1   Anggor
1   1   1   1   1   3   Dera*
            _____
1   1   1   1   1   1   1   Abau
1   1   1   1   1   1   1   2   Ak
1   1   1   1   1   1   1   2   3   Awun
1   1   1   1   1   1   1   2   3   3   Namie
                _____
1   1   1   1   1   1   1   1   1   1   1   Oksapmin
1   1   1   1   1   1   1   1   1   1   1   2   Ngalum
1   1   1   1   1   1   1   1   1   1   1   2   4   Mianmin
1   1   1   1   1   1   1   1   1   1   1   2   4   4   Bimin
1   1   1   1   1   1   1   1   1   1   1   2   4   4   5   Telefol
1   1   1   1   1   1   1   1   1   1   1   2   4   4   5   5   Tifal
1   1   1   1   1   1   1   1   1   1   1   2   4   4   5   5   5   Faiwol
1   1   1   1   1   1   1   1   1   1   1   2   4   4   5   5   5   5   Kauwol
                        _____
1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   Amto
1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   Busa
1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   Yuri
1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   Nagatman
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* The Dera language was not included in Steer's review

9.2 Estimation of language population figures

The majority of the objects in the database for the Upper Sepik-CNG Project were collected in the 1960s and 1970s. Therefore population figures recorded from that period would be the most appropriate. There are, however, several likely sources of error for the population figures recorded at that time:

- in some instances, communities speaking a particular language were located on both sides of the Indonesian-Papua New Guinea international border, and population figures for [West] Papua were non-existent or unobtainable;
- census districts were not defined according to language groups but for the convenience of administration and for the purposes of this study we need the number of speakers for each language group.

There are a number of sources that have attempted to assign population figures to language groups in the study region: Loving and Bass (1964), Laycock (1973),

Wurm and Hattori (1981), and Ethnologue (Gordon 2005) - see Table 3. There are also population figures of particular language groups provided by various researchers who worked in the study region.

Loving and Bass do not state exactly how they arrived at their population figures but given that they had the co-operation of local administrative officers, and are explicit that census divisions do not follow language boundaries (1964: 7-8), it is likely that they aggregated village census data. These figures would have been those available from 1963 or earlier, as the data was compiled by Loving and Bass in January 1964. This source data would be extremely difficult to locate today and in many instances may have been lost due to deterioration and destruction of local records over the last few decades.

Donald Laycock, the Australian National University linguist, provides population figures for the languages of the upper Sepik (Laycock 1973) but he has assigned some villages to incorrect language groups (eg. Yuri and Anggor languages). Laycock's estimates of population were based on official census figures recorded between 1966 and 1971 (Laycock 1973: 56, note 3), adjusted to the arbitrary date of January 1970. It is not clear whether he used aggregate figures for census districts or was able to aggregate figures for individual villages (which would be more reliable).

Wurm and Hattori (1981) advise that their population figures are based on censuses taken in the decade 1970-80 but in the case of the upper Sepik area, and some of the Mountain-Ok languages, these figures are the same as Laycock's. Again, it isn't clear whether or not these population figures are aggregates of village censuses.

Ethnologue (Gordon 2005), the database of languages on the website of the Summer Institute of Linguistics, provides population figures based variously on census data from 1981 to 2003. These figures, whether or not they are aggregates of village censuses, are all from a period significantly later than the 1960s and 1970s when the majority of the objects were collected. The Ethnologue figures show an increase of eighteen percent in the population overall, over thirty years or so. This is probably due to a decrease in child mortality and an improvement in general health, despite

the irregularity of paramedical services. However, the population increase was probably as much as thirty percent, as only half of the figures provided by Ethnologue come from sources dated 2000-2003.

Table 9.3   Populations of language groups according to four data sources.

Language	Loving & Bass 1964	Laycock 1973	Wurm & Hattori 1981	Ethnologue 2005	Corrected approximations 1970
ABAU	3386	4545	4545	7267	4500
AK	-	83	83	75	100
AMANAB	2674	3354	3354	4419	3400
AMTO	189+	230	230	200	250
ANGGOR	1256	2565	2565	1266	1500
AWUN	-	384	384	400	400
BAIBAI	313	271	313	345	300
BIAKA	401	454	454	595	450
BIMIN	-	1100	1100	2250	1100
BUSA	226	307	307	244	300
DERA	687	1474	1474	687	1500
FAIWOL	-	3400	3400	4500	3400
KAUWOL	-	500	500	?	500
KWOMTARI	782	824	824	600	800
MIANMIN	-	1500	2200	2200	1500
NAGATMAN	483	496	496	600	500
NAMIE	-	3012	3012	4944	3000
NGALUM	-	[?18000]	[?18000]	[?18000]	[?18,000]
OKSAPMIN	-	6700	6700	8000	6700
TELEFOL	-	3132	4000	5400	3100
TIFAL	-	3329	2800	3600	3300
WAINA	838	1100	1100	1000	1100
WARIS	1483	3160	3160	4000	3200
YURI	997	740	740	1142	1200
TOTAL		[- Ngalum] 46515		[- Ngalum] 58552	[- Ngalum] 45000

All things considered, it seems that the Laycock figures are those that should be used, with an adjustment for the significant error of including several Yuri villages in with the Anggor villages. Given the figure of almost a thousand Yuri speakers in Loving and Bass (1964), an estimate of 1200 in 1970 would be reasonable. The estimate for Anggor should be increased from the Loving and Bass figure of 1256 to, say, 1500. The figure of 2565 Anggor speakers provided by Laycock seems seriously in error given that the Ethnologue figure based on the 1990 census is the same as that provided by Loving and Bass based on 1963 data.

9.3 Language and history in New Guinea

For social scientists interested in population histories, language is considered an important tool with which to infer relationships between discrete social units (Durham 1992: 335; Jordan and Shennan 2003: 43; Kroeber 1941; Mace & Pagel 1994: 552). There are a number of reasons for this:

- language offers a reliable framework for comparison because all languages exhibit conventions in morphology, syntax and phonology and through an understanding of semantics these can be used to determine the manner and degree in which different languages share affinities (Anderson 1991);
- languages are often considered to be relatively stable through time. Apart from the obvious reason that a language must be sufficiently coherent across an inclusive social sphere, there are numerous cultural factors and social mechanisms that prevent dramatic deviation from linguistic norms (Durham 1992);
- because language acquisition takes place before puberty and within a limited social sphere, ensuring that an individual will master most of their language skills when closest to their nearest kin, the transmission of language is considered relatively conservative (Komarova & Nowak 2001).

Therefore, unless there is significant environmental or demographic change, or introduction of new personnel, technology or culture, languages should change gradually and predictably (Croft 2000). Even where there has been a considerable time since two related populations diverged, in most cases each will retain a degree of common elements and these can be used to construct etymologies and glottochronologies with which to determine a common linguistic heritage and the historical distance between two languages (Nichols 1997, 360-362; Ruhlen 1987: 42).

Nevertheless, questions remain as to which features of language are the most resilient in a context of ongoing social contact between communities that speak different languages (Durie & Ross 1996; Foley 2000: 392-393; Terrell 2001a). For example, historical linguists have argued that only certain kinds of words are susceptible to borrowing and that things such as 'pronouns, body parts, and other

fundamental vocabulary are seldom borrowed' (Ruhlen 1987: 42). But, in places such as New Guinea where there is great diversity in language, and those languages often have few speakers, the utility of using such characteristics to infer phylogenetic relationships between populations has remained controversial (Foley 1986: 209). Indeed, the fact that the number of potential cognates is relatively small, and because a significant range of linguistic components have been demonstrated to be prone to diffusion, there would seem to be limitations in the scope of linguistic characteristics that can be confidently used to establish genetic relationships (Foley 2005: 109). Even features that are largely considered resilient in most regions of the world – such as structural components including grammar and morphology, and even more importantly phonemic features–verb roots, bound morphemes and pronouns have been demonstrated as being prone to borrowing in parts of New Guinea (Bradshaw 2001: 285; Donohue 2002; Foley 1986: 212; 2000: 359). Indeed, it may be that singular features such as fixed or free configurations of pronouns are the only reliable marker for distant language relationships (Ross 2005).

For Foley (1986: 24), New Guinea's linguistic diversity is a product of the region's economic and subsistence structures and the weakly integrated communal units they facilitate. Social relationships within and between these units are fragile and disrupted, so that new social relationships are constantly being forged, often between people who speak disparate languages.

Two different processes of change are discussed by Foley: shift and convergence. Shift by and large accompanies demographic processes whereby small and often contracting language communities adopt the more widely spoken and prestigious languages of their more populous neighbours (Foley 1986: 24).[45] In other cases, migration and displacement of social units can result in dramatic shifts whereby either a migrant population or a minority local population will relinquish their own language (Roscoe 1989a: 145).

On the other hand, convergence, a process where two languages become more alike over time, occurs when language elements are diffused between communities. In

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[45] Although in cases where a prestigious language or lingua franca has gained wide geographic pre-eminence, these languages have rarely usurped a local vernacular (e.g. Foley 1986: 36).

such cases, close social ties, often facilitated by the exchange of products and personnel provide the means by which language elements are acquired.

Significant language borrowing is believed to have occurred throughout New Guinea (Foley 2000: 392). Where there are substantial trade networks or cycles of exchange, especially those accompanied by a marked exchange and diffusion of cultural forms, these have presumably promoted greater rates of language diffusion. This is because of both the increased level of social engagement and the greater possibility of functional change via the introduction of new words that accompany introduced cultural forms (Aitchison 2001, 146). Lithgow (1973), for example, found that in a community on Woodlark Island in Milne Bay Province, fifteen percent of cognates changed over two generations due to borrowing, inclusive of some changes in grammar. Lithgow (1973: 108) concluded that the process was an active one: 'Speakers love to borrow from adjacent languages and dialects, either from boredom, from social pressures, or from a desire to display their knowledge'. Although Lithgow (1973: 108) went on to concede that the extent and rapidity of the change was probably due to the emerging dominance and prestige of some languages after their promulgation by missionaries and government agencies, he concluded that the dynamic linguistic interchange between communities had its origin in the traditional maritime trading culture that existed across Milne Bay Province.

Even in the absence of any regional social or political integration, the accumulative process of diffusion may have led to the existing pan-regional structural affinity of non-Austronesian languages (Foley 2000: 392). In keeping with the demographic patterns outlined for much of New Guinea, especially where there were no large trading cultures, it must be considered that in most cases convergence resulted from the accumulative effect of a number of small and localised interactions. For example, Donohue and Crowther (2005: 182) have suggested that within a period of a hundred years or so, interaction between small autonomous communities of hunter-gatherer horticulturalists, with a preference for endogamous marriage and a relative absence of economic ties, has given rise to areal clusters of linguistic affinity across a large area near the Sissano Lagoon in North-Central New Guinea (NCNG) and these transcended boundaries between languages belonging to at least

four families. These not only included the sharing of vocabulary but also involved changes to phonemic systems that are usually assumed to be very resistant to borrowing and require relatively long and intense contact between communities.

Donohue and Crowther (2005: 172) do point out that convergence within this region was probably activated by a recent period of substantial demographic movement and indeed, the mechanisms responsible for convergence and ideas concerning the rate of language change across much of New Guinea prior to colonisation remain somewhat unclear, as data are not available (Foley 2000: 392). Nevertheless, whatever the processes responsible for the linguistic picture that exists in New Guinea, they have resulted in significant language diversity; it is also common for neighbouring languages to demonstrate little affinity even where their speakers share a considerable amount of other socio-cultural affinities.

9.4 Language and history in the study area

The study area is a good candidate for an enquiry into these processes. Firstly, its diversity is extreme, even for New Guinea. Secondly, trade and extended contact between communities was less intense than commonly found for other parts of New Guinea. And thirdly, populations that seem to have had no recent contact demonstrate strong linguistic relationships.

Prior to the arrival of linguists and anthropologists, explorers and patrol officers did not hesitate in proposing ethnic divisions for populations in the Upper Sepik and cited a range of *significata*, including physiognomy, subsistence practices and cultural patterns (e.g. Jeffries 1950; McCarthy 1936: 12; Robinson 1932: 2; Thurnwald 1914: 18-19). Language was seen as a reliable means of determining ethnic divisions or 'tribes' as other cultural characteristics seemed to pattern according to these divisions (e.g. Calcutt 1956: 7; Geyle 1954: 5). Importantly, during this time of early contact, it appears that social relations were less intense between those who spoke different languages; indeed, some patrol officers considered that interaction and marriage between linguistically disparate communities had increased significantly after pacification (e.g. Hutchings 1968: 3; Knott 1964: 4).

When anthropologists started to work in the region in the 1960s, there remained some interest in determining ethno-linguistic divisions even though most researchers focussed their attention on a single small community. Some made attempts to extract information concerning origins through oral histories, and where they were provided they often demonstrated a close relationship with language (e.g. Craig 1980b: 7-10; Gell 1975: 20, 24).

Even where putative homelands were distant, they were usually inhabited by communities which spoke the same or closely related languages. Anggor speakers, for example, share the greatest linguistic affinity with the Dera (Kamberatoro) who inhabit neighbouring territory in the western Border Mountains. As shown above these languages belong to the family isolate Senagi, which shares no relation to any other language grouping. There is no evidence that Anggor villages have, in recent times, engaged in any level of social contact with Dera villages although Anggor communities, even those furthest from Dera territory, acknowledged them as their closest genealogical relatives and the Dera territory as their ancestral home (Huber 1974: 35-38).

Craig (1980: 7-10), who has also collected oral histories from communities of the Green River area of the USB, found that the Abau share a belief that their homeland was far to the east along the Sepik near its confluence with the May River. This area is presently inhabited by other Sepik-Ramu speakers, the Iwam, who are indeed the Abau's closest linguistic relatives. More distantly related Sepik-Ramu speakers, the Namie, occupy significant territory between the Abau and Iwam.[46]

By far the most obvious correlation between language, culture and history is found in CNG where most of the languages are very closely related and the majority of languages are mutually intelligible. Glottochronologies carried out by Alan Healy suggest that the Ok Family of languages began to split up around 5000 B.P. and that the differentiation of at least three of the Mountain Ok languages –Telefol, Tifal and

[46] Conversely, Craig (1968b: 9) found that in the Border Mountains directly to the north of the western Abau communities, the Yuri, who speak an isolate language, share a myth that emphasises local origin

Faiwol – occurred by 2000 years ago (Healey, personal communication 1965, cited in Craig 1969b: 16-17).

As will also be discussed below, the culture of the Mountain Ok groups is underpinned by a shared origin myth and a common initiation cult, and cultural modes have been maintained across the region.[47] To some degree, population movement and trade would have contributed to the maintenance of cultural affinities (Barth 1971; Hyndman 1979: 56). Oral histories for the Mountain Ok reflect a demographic pattern where, over the last 300 years, persistent expansion of highland core populations has pushed fringe populations down into the lowland periphery (Hyndman and Morren 1990: 21; Morren 1986: 265-271; Swadling 1983: 19-23).[48] Often, these movements were preceded by conflict between groups (Morren 1986: 288). Sometimes, displaced social units were absorbed into local populations and at other times displaced larger units went on to colonise underutilised or disused land (Hyndman 1979: 56). During this time differences have emerged, however, and these are not only linguistic in nature but are apparent in particular facets of cultural practices, subsistence, settlement pattern and social structure. Nevertheless these changes are in general not the result of contact with non-Mountain Ok groups but are largely the result of drift and ecology (Barth 1971; 1987; Craig 1969b).

Unlike CNG, however, there are many groups in the USB and Border Mountains who do not share any genetic relationship. A particularly important feature of this region is the existence of the three isolates – Yuri, Busa and Nagatman – and the very small language family isolate, Amto-Musian (Laycock 1975). Except for the Yuri, the isolates are situated in the lowlands, have relatively few speakers (500 or less) and small territories, and their neighbours have much larger populations and bigger territories. It is likely that the Yale (Nagatman), and more so the Amto-Musian and Busa speakers, have been going through a period of demographic decline for several generations while at the same time becoming increasingly

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[47] This shared heritage is signalled by the pan-regional usage of the term *min* for the Mountain Ok, and common recognition of the village of Telefolip as the most important site associated with Mountain Ok mythology (Brumbaugh 1980a; 1980b; 1990; Jorgensen 1996).

[48] Swadling (1983: 21) has provided an excellent history of migration within the region constructed from published and unpublished oral histories provided by anthropologists and other people who worked in the region

restricted territorially by the expansion of Abau speakers, and by the movement from the north of populations speaking Kwomtari languages.[49] If language change took place, it would most likely be in communities belonging to these isolates.

The smallest of the isolates, Busa, comprised only three communities when linguistic surveys were undertaken and all communities were within a day's walk from those belonging to the three larger language groups. There is evidence that a good deal of interaction, including inter-marriage, occurred between the Busa villages and their neighbours at the time at which the collections were made (Bragge 1964; Lewis 1963: 5). Nevertheless, surveys have revealed relatively little lexical similarity – less than four percent of shared terms – between these communities (Foley undated; Steer 2005: 39). Indeed, studies suggest that the Busa, located north of the Sepik, may share most cognates with the family isolate Amto-Musian situated south of the Sepik (Conrad and Dye 1975: 11; Loving and Bass 1964: 3). The other, larger isolates, Yuri and Yale (Nagatman), also appear to share few cognates with surrounding languages.[50]

Another small language group for which there are data, the Biaka, exhibit a lexical relationship of less than five percent with non related neighbours in the Border Mountains, neighbours with whom they appear to strongly interact (Huber 1974: 38; Steer 2005: 42). Clearly there are mechanisms that are maintaining difference under circumstances where language blending would be most expected.

While incidences of significant language borrowing have yet to be determined, multilingualism seems to have been common. Rodney Chisholm (1968; 1969) found multilingualism present in communities belonging to all five language groups around Green River station. He concluded that in all cases where villages speaking two different languages were contiguous, people would speak the other language 'sufficiently well to be able to converse' (Chisholm 1969: 9). Bragge (1964: 5) also reported bilingualism in the Biaka, Busa and Yale communities and that bilingualism reflected marriage relations between the communities. Huber (1974;

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[49] Donohue and Crowther (2005: 171-172) have argued that Kwomtari speakers moved south as a result of the expansion of speakers of Border languages around two hundred years ago.
[50] The highest is five percent shared by Nagatman and Namie speakers (Steer 2005: 40-41)

36) reported that in the Anggor village of Nai #1, the people were tri-lingual in Amanab, Biaka and their own Anggor language.

Foley (1986: 29) has pointed out that the incidence of multilingualism is largely a function of demographics: individuals belonging to small language groups, being more reliant on social relations with individuals that speak other languages, have a greater incentive to learn those languages. Graham (1981) confirms this pattern for the study area with the observation that Busa communities speak the languages of the more populous groups with whom they exchange women but that their neighbours did not speak Busa in return.

It may be the case therefore that where communities remain socially discrete, language convergence is kept in check by multilingualism. Patrol officers commonly found that multilingualism did not extend far from linguistic borders and that the majority of villages were monolingual (e.g. Welsh 1969: 6). This would mean that the majority of communities near linguistic boundaries would have had neighbouring communities on either side whose members not only spoke different languages but who would not have been familiar with a language other than their own. Therefore not only would have the avenues for language change through metatypy been limited but it would have been counter-productive to blend or drop languages (Ross 2005: 21).

Further, bilingualism is usually exclusive to particular men, those 'with extensive outside contacts through trade or exogamous marriages' (Foley 1986: 29). Litteral (1978: 26), for example, found that only a few Anggor men were actively bilingual and as a consequence of their being raised in a village speaking another language. Whereas most men found other languages intelligible but could not speak them, Litteral (1978: 26) reports that for Anggor women, bilingualism was 'extremely limited or nonexistent' (Foley 1986: 30).

9.5 Discussion

The languages in the study area do seem to reflect a history of expansions, migration and bifurcations of populations. It may be possible that multilingualism was a significant factor in the maintenance of this language picture. Multilingualism

results from interaction between people belonging to two speech communities. It is true that particular men are actively multilingual, it surely is a product of their being more active in inter-community social relationships and of travelling further for that interaction. As will be pointed out later, while some exogamic women will originate from other language groups, it may be the case that in most circumstances they will be the minority as exogamic marriage exchanges were generally undertaken between contiguous communities. It is therefore possible that the demic picture for women is little different to that of men. Most certainly, however, women's social spheres were much smaller and likely to reflect a stronger affinity with language divisions, especially where language groups are not too small. If this is so it is possible that women's cultural assemblages will also demonstrate a stronger relationship to language.

10. Social structure and descent

10.1 Introduction

Those who attempt to identify historically significant population aggregates within traditional societies are faced with a number of problems. Traditional societies commonly have weakly asserted descent structures and an individual's genealogical position within a descent unit is often obscure; there may even be no certainty as to whether there are bona fide genetic connections between some members (Barnes 1962: 6; Sahlins 1965: 104; Strathern 1968).

Weakly asserted descent units are features of many societies throughout New Guinea. Reckoning of descent is usually patrilineal, with bilateral associations often given considerable weight: accordingly, kinship has often been framed as a product of a tenuous dialectic between obligation and optation that results in a 'looseness' or 'flexibility' in social relationships (Barnes 1962: 7; 1967; Brown 1962; Harrison 1985: 415; Heider 1970: 6; Kaberry 1967; Lepervanche 1967; Watson 1970). Such observations are no less common, indeed are very apparent, in ethnographies for the study area and there appears to have been few social conventions to obstruct individuals who wished to establish ties beyond their kin (Bercovitch 1989: 76; Craig, R. 1969: 177; Huber 1974: 9, 20; Hyndman 1979: 49; Jorgensen 1981: 180; Morren 1986: 175; Pouwer 1964: 144).

An important feature of many New Guinea societies that has been seen as undermining the objectification of descent relationships is the relative lack of formal leadership coupled with an ideal of equivalence which meant that there was little to be gained from filiation (Read 1959: 427-9; Scheffler 1985). It has even been demonstrated that for many hunter-horticultural societies, such as those found in the study area, inequality was seen as something that would ultimately undermine the stability or even viability of the larger communal unit (e.g. Bercovitch 1994).

Considering that many of the causes of intra-community conflict resulted from personal grievances, the ideal of parity, operatively asserted through the obligation to share, was crucial for social cohesion; the accumulation of wealth by the 'Big Men' of certain highlands societies of Papua New Guinea had no counterpart in the

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study area (Brumbaugh 1980b: 29; Huber 1974: 214).[51] Also, as Bercovitch (1994: 504) points out, parity was a mechanism for pooling skills needed for the community to thrive:

> The Atbalmin recognise that people have different characters and abilities. Some men are good hunters, while others are good gardeners. Men and women have different bodily powers. As long as people exchange, such differences can be beneficial. They motivate people to exchange and create close relationships.

Throughout the study area, there was a general ambivalence towards filiation and descent (e.g. Jones 1980: 40). Huber (1974: 112), for example, remarked that the Anggor understood the 'existence of patrilineages as historical facts…not as abstractions of symbols relevant to social action'. Ruth Craig similarly concluded that for the Telefolmin (1969: 177):

> ……as personal obligations are not defined in terms of common group membership or formal kinship, a man cannot rely on others just because they are fellow villagers or are particular kin of his. Rather, it is the number and quality of his personal friendships that count.

Indeed the ability to trace descent at any depth could be seen simply as a product of continuity in residential patterns. It is therefore understandable that most informants were rarely able to trace genealogies beyond three generations (e.g. Brumbaugh 1980b: 109; Jorgensen 1981: 211).

What is most apparent in the ethnographic accounts is that the sibling relationship was pivotal to the formation of basic social units and to the existence of the larger communal unit. The sibling relationship united conjugal units for the formation of extended corporate units; it was implicated in decisions regarding crucial social functions and obligations, such as marriage and brideprice; and the cross-sex sibling relationship was the tie linking two exogamous social units (Brumbaugh 1980b: 86,

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[51] There was a prohibition of using certain staples such as taro as an exchangeable commodity; food was to be repaid only in kind. Negative reciprocity in the exchange of valuables was also deemed as unacceptable between members of the same community (Brumbaugh 1980: 29).

112; Gell 1975: 43; Jones: 1980: 68; Juillerat 1996: 337ff; Pouwer 1964: 141; Wheatcroft 1975: 94).

According to Pouwer (1964: 144) the importance of this relationship led to the bilateral expression of kinship:

> The bilateral tendency…..finds expression in the way of classifying distant kin, in the way of 'lumping together' all close and distant relatives belonging to one's own generation. Collectively, all members of one's own generation, to whom one is related through father or mother (including cross-cousins), are referred to by the term *kaga-pik ning, piki-nigki* or *bap-ning* irrespective of their sex. *Kaga* means: person (people), man (men); *Pik* is the term of reference and *bap* the term of address for elder brother, *ning* is the term of reference and of address for a younger sibling (brother and sister). Parallel and cross-cousins help one. 'They are my kaga pik-ning aren't they?'

The family or household unit was the most ubiquitous and stable functioning social entity for all groups in the study area and it was relatively autonomous and self-reliant. Its adult membership comprised brothers and their wives or, where endogamy, bilocality and/or uxorilocality were in operation, a married brother, his sister and her husband. These units could be self-reliant because they comprised two sets of producers that could provide a regular supply of food, even when sickness or garden failure afflicted members of one of the conjugal units (Brumbaugh 1980b: 30; Gell 1975: 10; Juillerat 1996: 92-99; Pouwer 1964: 141).

Although social relationships were strongly weighted according to bilateral associations, residency was largely determined by a male's patrilineal association because this usually determined rights to land and the structure of land guardianship (Juillerat 1996: 128). A wife's or mother's father's land could be accessed but this would usually require approval by their close male relations (Brumbaugh 1980b: 60). Even for the most mobile of populations in the lowlands and highlands fringe, father-son relationships provided the basis for residency. The territory through which a community moved was superimposed with a mosaic of different land-holding histories connecting male members of the larger communal unit. The

consequence of this system of land tenure was that almost all social groups for which data are present comprised small patrilineages as a result of a succession of male siblings maintaining residency over a number of generations.

10.2 The USB and Border Mountains

In the lowland plains, where large communal houses or homesteads were a common form of settlement at time of contact, a community comprised a patrilineage of approximately thirty people linked to a common ancestor from two to five generations back (e.g. Bragge 1964; Craig 2008: 38; Schultze-Jena 1914: *passim*). These would have at most one or two additional smaller lineages linked through affinal ties. Bragge's (1964: unpaged) description for the Nagatman 'village' of Karboni provides a good illustration of such a social unit:

> [T]he major group in the village is a patrilineage called Kakiri, Kakiri being the common patrilineal ancestor in the fifth ascending generation. A second, minor patrilineage has developed from a common ancestor in the fourth ascending generation, called Nera. Nera is believed to have been adopted from Marakwini. His son married a granddaughter of Kakiri, thus creating relationships between the two groups. Other people in the village who do not come within these groups are the women who have married into the village and related people from other groups living in the village….. The Nera patrilineage seems to be an exception to the general rule, as the village group is generally the exogamous group in the Nagu census division.

It is important to note that the in-migration of the lineage from Marakwini was activated according to a matrilateral link facilitated through a past exogamous marriage. This would have been a common avenue for lineage fusion although traditional communities in the lowlands were generally small and often comprised only one line.

For some lowland and hills groups where settlements were notably larger, such as those found in the vicinity of the Yellow River and much of the Border Mountains, communities were segmented into patrilineages organised into small patriclans with a dominant or founding patrilineage as the core (Gell: 1975: 77ff; Juillerat 1977: 6; Kelm & Kelm 1980: 220).

In the Border Mountains, communities of 100-250 people consisted of one to a dozen or more clans each with approximately twenty to fifty members each (Gell 1975; Huber 1974; Juillerat 1996). Clans could form by a process of accretion, with lineages or families joining after the fissioning of some other descent group or community, although in-migrating units usually maintained their patrilineal identity after assimilation (Gell 1975: 38; Huber 1974: 110). As a consequence, Border Mountains lineages had less genealogical depth than those observed in the lowlands, and social units tended to break apart more frequently and move between communities: even clans moved between villages, were able to maintain their descent status, and assimilate smaller descent units within the recipient village.[52]

While clans had little social or political significance, they were important as exogamic units and helped define broader inter-community alliances (Juillerat 1996: 298). In the northern Border Mountains, clans were additionally organised into sub-moieties and moieties (Gell 1975: 37-40; Juillerat 1996: 291). These had little significance for marriage but provided a means of organising the clans of these relatively large populations into a more coherent structure of alliance.[53]

10.3 CNG

Mountain Ok descent organisation has been differentiated according to an east-west axis: bilateral in the west and patrilineal in the east (MacKenzie 1990: 31; Barth 1987: 11). However, although large patrilineage clusters and patriclan groupings were reported for populations in the east and on the northern slopes of CNG (Barth 1971, 1975; Eggertsson 1997; Morren 1986: 164; Perey 1973: 67; Poole 1976: 235), they were a feature of the Ngalum in the Sibil Valley of [West] Papua (Pouwer 1964). The Mianmin of the northern slopes of CNG probably represent an intermediate between the lowland and highland descent patterns. A Mianmin parish included small communal units that, whilst involved in a regime of shifting and dispersed settlement patterns, maintained a stable connubial and coordinated ritual

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[52] This was the case for an Iafar clan which, sometime in the 1960s, had split with segments becoming predominant descent units of two Anggor villages (Huber 1974: 272, Table 4; 273, Table 5).

[53] Gell (1975: 39-42) points out that the Waina moieties were composed of either local or immigrant clans.

cycle. Morren's description of Mianmin lineages (1986: 164) suggests that they were relatively strongly asserted:

> Each [lineage] is chartered by a genealogy, which after four generations becomes a straight line list of kamok ['big men']. Oral tradition is ordered by the genealogies…..[P]arishes tend to have four lineages each [and are named after] prominent big men [of] two or three generations [prior]. The lineage also is the core of residential units.

Morren's figures (1986: 164) put the average population of a lineage at around forty persons, comparable to lowland lineages and Border Mountains clans; they were also strictly exogamous (Morren 1986: 181). The major difference was the degree to which Mianmin lineages tended to cooperate and aggregate, and this varied according to differences in the environment of Mianmin territory. In the lower altitude zone to the north and west, Mianmin hamlets were smaller, more dispersed and, like lowland communities, settlements were usually synonymous with a particular lineage; ties between lineages/settlements were weaker (Morren 1986: 194).

In the higher altitude zone of the southeast, Mianmin lineage clusters were united territorially and coordinated their cycle of settlement shifts; this cycle included a protracted period of common settlement where conjugal units reverted to a dual residence pattern (Morren 1986: 185). This strong corporate relationship among Mianmin lineages of the southeast corresponds with communal patterns found for other agnatic Mountain Ok groups. The Mianmin parish was typical in that there was full cooperation in the cycle of rituals and initiations, which was integrated into the settlement cycle. Unlike other descent groupings of CNG, however, the Mianmin lineages did not have any ritual significance. Only competent senior men with appropriate knowledge were assigned particular ritual roles (Morren 1986: 224).

All other agnatic units reported for CNG are described as patriclans, although sometimes these were smaller than Mianmin lineages, presumably as a result of greater social volatility, conflict and migration among those groups (Barth 1971). Some clans, such as those of the Baktamanmin, resembled those of the Amanab in

the Border Mountains, in both their size and the fact that lineages belonging to a clan often resided in different hamlets (Barth 1975: 111). Although the clans of the Oksapmin were larger, they represent the extreme in this case; their clans were not only dispersed throughout a parish, often with the small Oksapmin homestead having mixed clan membership, but also across different parishes (some of which belonged to other language or dialect groups).[54]

The clans of the Bimin-speaking Kwermin, on the other hand, appear to be relatively autonomous units that aggregated to form loose communities:

> [the] Kwermin are divided into four relatively independent settlements which are particular political arrangements on their own, with each settlement having a different constellation of patrilineages and patrilocal totemic clans and outside min/clan relations (Eggertsson 1997, held copy unpaged).

While the clans held particular ritual knowledge, maintaining their own cult houses and associated ancestral relics, they were not aligned according to any set of ritual functions (Eggertsson 1997).

In contrast to the Kwermin, their closest linguistic relatives, the Bimin-Kuskusmin, had patriclan divisions that were strictly organised according to ritual obligations (Poole 1976). Unlike the other multiple clan communities of the Mountain Ok, the eight clans of the Bimin-Kuskusmin shared a common origin myth (Poole 1976: 411). Their society was organised into two exogamous moieties of four clans each, with each moiety led by a pre-eminent clan. Each clan had well defined ritual functions and held particular cult knowledge passed on by 'totemic' ancestors. This ensured that the Bimin-Kuskusmin population formed a relatively cohesive social unit (Poole 1976: 487ff). Population figures (Weeks 1981: 101) from a period soon after Poole's field study indicate that each clan numbered about 80 persons – about the size of a large hamlet. The Bimin clans were arguably the largest and most stable agnatic units in the study area.

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[54] The parishes, with populations of 200-300 people, contained approximately 11-15 homesteads each of approximately twenty persons (Perey 1973: 66-68).

Mountain Ok populations from the central valleys to the west lacked segmentation, and large cognatic descent units of approximately one hundred to two hundred people integrated communities across large territories within the intermontane valley systems and the valleys and watersheds of the northern and southern slopes of the Star Mountains (Bercovitch 1989: 130; Brumbaugh 1980b: 109; Hyndman 1979: 53; Jorgensen 1981: 160).[55]

Sometimes, as was often the case of Tifal speakers, cognatic descent units were more or less synonymous with the parish (Bercovitch 1989; Hyndman 1979: 53; Wheatcroft 1975: 29; 96), but where large parishes were common they would sometimes contain several such descent units. In such cases, either the majority of people within each village may belong to one descent unit, or a village may have people with membership spread between two or three descent units (Brumbaugh 1980b: 75; Jorgensen 1981: 174).

Each parish had its own permanent cult house, situated in the most important hamlet or village within its territory (Brumbaugh 1980b: 183; Craig 1969b: 54-5). Descent lines were reinforced through supplication of renowned ancestors via ancestral relics preserved in the cult houses (Brumbaugh 1980b: 158). Each *tenum miit* was believed to hold a 'particular ritual competence, a sphere in which it excelled in accord with its origins and fundamental nature' (Jorgensen 1981: 161), such as taro, warfare or hunting rites.

As Jorgensen (1981: 163) has demonstrated, the cognatic descent units of the Telefolmin of the Ifitaman Valley are positioned to form a symmetrical and complementary division of the community in fulfillment of these ritual obligations and this led to, or rather maintained, some degree of integration across parishes. Co-participation in ritual activity, especially those involving initiation rites, provided

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[55] These are known as the *tenum miit* (Telefol) or *kinoomit* (Tifalmin and other Tifal speaking groups) (Bercovitch 1989: 130; Hyndman 1979: 52; Jorgensen 1981: 161). Pouwer (1964: 136) terms the Ngalum's largest descent units (*kaga-don*) as patrilineal clan. His description in terms of both size and membership suggests that these are synonymous with the cognatic descent units. The difference between the Ngalum cognatic descent units and those of the Tifalmin or Telefolmin appears to be that the name was strictly passed from father to son and that they were further partitioned into subclans that, like the Oksapmin clans, were diffusely distributed across the region's parishes. Importantly, unlike the Oksapmin the Ngalum clans had no exogamic function.

the mechanism through which members of descent units interacted and maintained ties (Barth 1971; Brumbaugh 1980b: 303ff; Craig 1969b: 71; Hyndman 1979: 53).

Beyond these ritual functions, the ties shared between *tenum miit* also helped to determine broader polities through inter-parish alliances (Brumbaugh 1980b: 142ff; Hyndman 1979: 53); although in no way can these alliances be seen as cohesive as, or as politically significant as, the 'tribal' or 'phratrial' configurations observed for highlands groups beyond the Strickland River to the east (e.g. Brown 1972: 40).

The *tenum miit* had origin stories, including founders and mythical events often linked to some geographical feature within their territory (Hyndman 1979: 53). For the Telefolmin of the Ifitamin Valley, the four major *tenum miit* were believed to have originated at Telefolip when Afek was still present at that settlement. All the villages in the valley were the result of dispersal from Telefolip (Brumbaugh 1980b: 74-5; 116-17; Jorgensen 1981: 161). Nevertheless, extensive genealogies did not exist for such units; at best they comprised sequences of notable men going back half a dozen generations at most. Each member's genealogical position was obscure and membership was passed from either parent through both male and female children and sometimes an individual could identify more than one way of tracing links (Brumbaugh 1980b: 108-109). In contrast to other groups in the study area, these groups had no exogamous categories based on descent, putative or otherwise. In fact, there was a bias for community and descent group endogamy (eg. Craig, R. 1969: 183).

For the Faiwolmin, on the central southern slopes, descent was more ephemeral. Faiwolmin society was not organised according to large cognatic units like the groups directly to the west and north or as clans like the groups to the east. Like the Kwermin and Baktamanmin, the Faiwolmin were made up of in-migrating groups, but unlike the Kwermin and Baktamanmin, the Faiwolmin maintained a non-segmentary system similar to that of the Telefolmin but without the large cognatic descent units. Incoming lineages maintained their identity and status:

> …when a lineage migrates to the Imigabip area they are gradually
> incorporated as Faiwolmin, especially by being introduced to the Imigabip

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cult house, keeping their lineage identity and changing their tribal identity (Jones 1980: 174).

Each patrilineage of the Faiwolmin held and maintained knowledge concerning a particular rite and therefore, like some of the larger agnatic units of other Mountain Ok groups, each lineage was differentiated according to a specific ritual function (Jones 1980: 177). As Jones reports (1980: 110):

Most lineages have some kind of special knowledge, the results of the using of which are made available to all the other lineages, the main products being taro and warfare success …the cult complex is the only arena in which and by which the entire … village is organized and seen as an ongoing totality.

10.4 Discussion

This discussion of the study area's social structure leads to a number of conclusions about the composition of Upper Sepik societies. Firstly, descent had little sociological function. Secondly, in all cases, even where there may be stronger evidence of patrilineal reckoning such as in the lowland riverine and plains communities, there was an overwhelming bilateral tendency in the manner in which society was structured and filiative connections within the community were weakly asserted.

This ensured that even where descent units were more strongly emphasised for the purpose of marriage exchange, membership for these groups remained relatively open. Therefore patterns of descent must be read more as a consequence than a determinant of residency, reflecting the tendency for segments to move between the larger communities and the relatively small communities to fission and recombine in times of social volatility and resource depletion.

Nevertheless, in the absence of all-out war there would have been limits to the social and geographic distance that social units moved, from community to community. In most CNG societies, most of the flow would have occurred within the parish. In geographic terms, the flow of people in the USB and the Border Mountains took place between contiguous communities; in terms of social distance,

this flow was not directed by existing filiative ties but by those established through recent marriage exchanges.

11. Marriage

11.1 Introduction

Most information about marriage systems in New Guinea has come from the highlands where exchange tended to take place between relatively large segmentary cognatic descent units. Such systems included an emphasis on establishing and extending new ties countered by a prerogative for maintaining some ties to groups with whom there was a history of association (Barnes 1962; Strathern & Strathern 1969: 154; Glasse & Meggitt 1969). Large clans may have had a number of exchange relationships, the majority involving neighbouring settlements with whom they maintained alliances underpinned by ritual and military obligations. A minority of exchanges were distant, with a tendency for greater economic significance (Barnes 1962: 8).

Where there were large cognatic descent units, these tended to be segmented and relatively endogamous, with taboos specifically preventing individuals from marrying too close (Cook 1969: 105; Glasse 1969). Marriage was regulated according to a prescribed number of generations or by a system of delayed and sometimes somewhat indirect exchange, accompanied by bride-wealth in order to better distribute ties among agnatic units within the larger cognatic descent groups or communal units (Strathern 1984; 45-46; Strathern & Strathern 1969: 141).

Where information has been provided for the sparsely populated lowland areas of inland New Guinea, connubial patterns have been described as localised and involute, whereby contiguous larger communal entities or small agnatic residential units are engaged in cycles of reciprocal exchanges of women; neighbouring groups form a sphere of ties, the strength of which may lead to some residential aggregation of small social units, or movement of social segments between communities (e.g. Stasch 2003).

Apart from the northern and eastern Border Mountains and parts of CNG, there are mostly qualitative observations concerning the constitution and boundaries of exogamic units, the preferred exchange modes, the extent of marriage taboos, and information as to how rigorously existing marriage rules were followed. What is apparent from the data is that differences between marriage patterns were a

corollary of demographic and settlements patterns, which were strongly regulated by the environment.

Exchanges could take place between proximal but autonomous communal units or between segments or kindred units in villages or parishes. Where settlements or more mobile social aggregates were small (less than around sixty persons), they appear to have been almost exclusively exogamic, but where settlements were over a hundred individuals, the majority of marriages were endogamous.

11.2 The Border Mountains

The Border Mountains marriage systems range between closed connubia involving a hamlet cluster or clusters comprising large exogamic units involving a regime of direct exchange ('sister'-exchange), to concentric and more open systems involving contiguous settlements and a generalised pattern of reciprocity.

Some Waina communities represent the former (Gell 1975: 53). In Umeda, for example, there were essentially four exogamic units: three residentially discrete clan groupings (hamlets) of one moiety and the other moiety which comprised three smaller clans of mixed composition.[56] Ideally, exchange relations took place between them every three generations, with prohibition restricting marriage with MFM's and MM's clans (Gell 1975: 64).[57]

Direct exchange ('sister'-exchange involving real sisters or classificatory sisters) accounted for the majority of marriages within a Waina village, ensuring the closure of exchanges between clans in line with the proscribed generation.[58] Bride-purchase was not an option and men who could not provide a 'sister' to exchange were reliant on the remarriage of widows within their community. As far as inter-village marriage was concerned, Gell (1975: 20-24) observed that only Punda had marriage exchanges with Amanab-speaking neighbours and that, in the past, clans in Umeda had marriage relations with Waris-speaking groups to the north and west.

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[56] These provided exogamous units of approximately fifty persons (Gell 1975: 48, Fig. 3).
[57] Gell (1975: 27) noted a preference for distant bilateral cross-cousins; essentially the ideal would be FFFZDDD for male ego and MMMBSSS for female ego (see also Juillerat 1996: 308).
[58] A figure of around fifty-six percent was given for Umeda (Gell 1975: 53)

Probably the best data for the study area are provided for the Amanab by Bernard Juillerat. Amanab clans were the exogamic unit, but these clans were smaller than those of the Waina and not residentially discrete (Juillerat 1981: 9-11). What Juillerat calls 'sub-moieties', which were relatively weakly asserted, were demographically and socially synonymous with the Waina exogamous unit but, unlike the Waina hamlets, the sub-moieties were not exogamous (Juillerat 1996: 293).[59]

Although the Amanab had the same prohibitions as the Waina, the size of Amanab clans and the mixed affiliation of hamlet membership led to what Juillerat described as a situation of generalised reciprocity, and there was often a disparity in women exchanged between the clans (Juillerat 1996: 298).[60]

One feature of Amanab marriage customs that set them apart from other groups in the study area was the practice of bestowing girls at a very early age to a boy considered suitable by the girl's parents (Juillerat 1996: 318; Kaibo 1967: 3). Sister-exchange accounted for around nineteen percent of marriages in Iafar and, curiously, twenty-three percent of endogamous marriages compared to thirteen percent of exogamous marriages.[61] Bride-purchase was not practised by Amanab-speaking communities that exchanged with neighbouring plains communities (Read 1962: 5).

Juillerat's figures demonstrate that close to fifty-eight percent of marriages were endogamous, with nine percent of the remaining women coming from Punda, the only contiguous community that spoke a different language. All marriage exchanges involved contiguous communities and the intensity of exchange was 'inversely proportionate to geographic distance'; the majority of which were within five kilometres and none further than ten (Juillerat 1996: 296-297, Map 4). It is important to note also that not only were five of the six villages, with whom Iafar

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[59] According to Juillerat's informants, it seems that, in the past, the sub-moieties functioned in a fashion similar to that of Waina clans, suggesting that the Amanab system became more relaxed and their settlements more diffuse after populations moved south during the Border expansion (Juillerat 1996: 293).

[60] Amanab moieties seem to have more marital relevance than those of the Waina: over sixty percent of endogamous Amanab marriages were between the moieties.

[61] Compare Juillerat 1996: 292, Table 14; 1996: 297, Table 16; 1996: 315, Table 18.

exchanged wives, Amanab-speaking but also that eighty-four percent of exogamous marriages were with clans that belonged to the Iafar moieties.

Further to the south, Huber (1974) describes the Anggor village of Wamu as having a complex structure of marriage with few negative rules. As for the Amanab, marriage arrangements were often mediated by a girl's senior agnates, and prospective husbands from any of the other clans were deliberated upon and selected according to merit (Huber 1974: 169).

Exchange appears to have been even more generalised than for the Amanab; indeed, direct exchange was almost absent (Huber 1974: 109-110). When Huber undertook his fieldwork in Wamu, he observed that eleven out of the twenty-one existing marriages, and over half of the marriages 'recorded in genealogical recollection', were endogamous, a high proportion for a village of around ninety-five people with only three clans (1974: 164, 190). Not surprisingly, Huber's observations suggest that there was a relaxation of prohibitions, resulting in a relatively high rate of actual cross-cousin marriage (1974: 189).

Sixty percent of inter-village marriages in living memory, however, had taken place with just three neighbouring Anggor-speaking villages, two of which were origin villages for Wamu lineages, suggesting that Anggor communities, like those of the Amanab, were constantly reconfiguring and reconstituting as men, family groups and lineages moved according to past marriage ties and descent relationships. This is reflected in the small clans and lineages, which appear to have been no more than small extended family units with very shallow genealogies. Huber's (1974: 273, Table 5) data concerning the composition of the Wamu population demonstrates an extremely diverse origin for the lineages that made up its clans – deriving from five Anggor and two Amanab villages.

One circumstance that had a significant impact on marriage exchange in the Border Mountains was the demographic disparity between the sexes during the period in which data were collected (Juillerat 1996: 290, Table 13). The ratio of marriageable women to men was less than eight to ten. This appears to have affected marriage patterns in two ways:

- there was a significant disparity in the age at which women and men married, thus providing a way of resolving some of the marriage needs through the provision of widows (and to a lesser extent divorcees); Juillerat's figures (1996: 323) indicate widow remarriage made up eighteen percent of Iafar marriages;
- men were more obliged to look for marriage partners outside their immediate community, even if it had a relatively large population (Juillerat 1996: 290).

11.3 The USB

For the lowland populations of the USB, only communities of the Yellow River area were composed of exogamic segments. There are no statistics provided for inter-village marriages, but since the Namie and Awun had relatively large villages, it can be assumed they would favour endogamy; Kelm & Kelm (1980: 46, 279) report that the Awun village of Abrau, which had a population of 181, was a closed connubium. Kwieftim, the only village speaking the Ak language, was the only other Yellow River community for which Kelm and Kelm provide data. It was a relatively small village of eighty-one persons and was exogamous. Presumably, the clans, which were approximately the same size as Iafar clans and Anggor lineages, were considered to be too closely-related and had to look elsewhere for marriage partners. The Kelms (1980: 279) report that Kwieftim engaged in marriage exchange with at least six villages belonging to four other language groups. Kwieftim villagers could speak several of the contiguous languages and appeared to have maintained close ties with their affines.

Sister-exchange was preferred in Awun and Namie communities, while for the Ak-speaking village of Kwieftim, delayed or indirect exchange seems to have been the practice (Kelm & Kelm 1980: 278-281; Robinson 1932: 2). Sister-exchange accounted for around sixty percent of marriages in Abrau, which is a little higher than, but consistent with, figures from most other lowland communities. Abrau comprised thirteen exogamic patriclans and, as stated earlier, was endogamous. The

marriage taboo appeared to have only applied to the mother's clan (Kelm & Kelm 1980: 279).

For the rest of the lowland plains, the situation appears to have been somewhat different, reflecting the difference in settlement patterns. One of the most thorough investigations of a small lowland sago-exploiting community was that undertaken by Patricia Townsend among the Sanio-Hiowe. Townsend reported that patriclans or lineages were scattered among the Sanio-Hiowe's small but closely-tied communities (Townsend 1978). Filiative ties between the units were close and marriage reasserted ties between the lineages while providing avenues for bilocality, an essential feature of Sanio-Hiowe mobility. Direct exchanges of women were fairly uncommon but bride-wealth was normal, suggesting that they maintained a coherent system of delayed reciprocity across the dispersed social units of these communities (Townsend 1969: 136ff).

Such systems possibly existed south of the Sepik at the base of the foothills of the Left May region and in the West Range, where the country is fairly rugged. Guddemi's (1992a: 308; 1992b) data suggests that for the Sawiyanõ of the Left May region, and possibly also for the Amto, who shared Sawiyanõ ritual and settlement patterns (Philip Guddemi pers. comm. 2007), this was the case.

As most lowland plains and river communities of the USB were restricted to large autonomous communal houses, or small homesteads with one, or occasionally two, agnatic units, they were invariably exogamous and, judging by early patrol reports, all marriage exchanges took place between contiguous communities.[62] Even when communities had coalesced into sizeable villages during the 1960s, agnatic units remained somewhat residentially discrete and exogamic (Craig 2008: page numbers not yet established, Fig. 2).

Traditional marriage patterns for the lowland communities along the Sepik River and across much of the plains were reported as following a regime of direct

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[62] Knott (1964: 3) concluded that the greatest determining factor of marriage across this region was walking distance between communities.

exchange.[63] A major difference between lowland and Border Mountains marriage practices was that brides were also commonly bought by the latter (e.g. Cottle 1953: 7; Knott 1964: 3). In such circumstances, bride-price was generated either by the prospective groom or by members of his agnatic group who, because of the relatively small community sizes, would have viewed the addition of a young productive woman as an asset (Craig 1973: 7/5). As with most Border Mountains communities, a significant proportion of lowlands men married widows (Craig 1973: 8/5).

Because these communities were small and exogamous, there may also have been greater incentives for uxorilocality. As the maintenance of demographic integrity was more critical to small lowland communities, they would have benefited greatly from inclusion of males, especially where local marriage needs had been met.

One avenue for uxorilocal or bilocal marriage may have been the practice of bride-service, a situation whereby a male spends time living and working with his father-in-law. Bride-service has not been reported for communities in the study area, but Guddemi remarked (1992b: 90-91) that Sawiyanõ men often resorted to uxorilocality and bride-service to obtain a wife. Guddemi's figures (1992b: 88) concerning bride-purchase, direct exchange and widow remarriage for the Sawiyanõ correspond with those from Craig's data for the Abau, so Guddemi's (1992b: 91) figure for uxorilocality, which accounted for thirty percent of Sawiyanõ marriages is compelling. Although Sawiyanõ hamlets formed parishes, which were approximately sixty percent endogamous, it is likely that much of the uxorilocality could have involved intra-parish marriage.[64] In the case of the small lowland plains and riverine communities it would be likely that uxorilocality would be less common but Craig (1968c: Book 2: 20) does make reference to one an example occurring amongst the Abau.

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[63] Craig (1973: 6/1) reports that for the Abau-speaking Idam population, direct exchange accounted for fifty percent of marriages at this time.
[64] Some of the most compelling data are provided by Morren (1986: 181-192) whose record of Mianmin marriages suggests that while sister-exchange was preferred for marriages between proximal parishes, more distant marriages usually involved uxorilocal residency.

11.4 CNG

In CNG, most of the ethnographies report that marriage took place between members of shallow cognatic units with a preference for delayed and indirect exchange, with an additional emphasis on bride-wealth (for example see Brumbaugh 1980b: 113; R. Craig 1969: 186-7; Jones 1980: 68; Jorgensen 1981: 166; but c.f. Morren 1986: 180-197).

As discussed earlier for Mountain Ok populations from the centre of CNG to the west, marriage played no role in structuring society. Hyndman's (1979: 52) definition of an exogamic unit for the Wopkeimin would be more or less appropriate for most of the region: '[the] close group of bilateral kin based on nuclear family and sibling relations'. Marriageability was essentially determined according to filiative distance from ego, and marriage was commonly accepted for the relationship of second cousin (Ruth Craig 1969: 182-3; Jorgensen 1981: 207, 231; Pouwer 1964: 142). For some groups, an even closer relationship was tolerated and a considerable number of marriages took place within the small lineages (Jones 1980: 68).

Brumbaugh (1980b: 82) observed for the Telefolmin that even 'the most convoluted genealogical argument' would be made to secure a marriage. There was no history of obligation to create a concentration of exchanges between any particular pairing of kindred units; delayed reciprocity and bride-wealth ensured better dispersal of marriage relations throughout the community. Therefore the practice of 'sister'-exchange was not common; Ruth Craig (1969: 186) put the figure for the Telefolmin Kialikmin parish at less than twenty percent.

These tendencies ensured a strong bias towards endogamy and a view that inter-community exchange was risky and destabilising – not only a risk of the marriage not being reciprocated, but also of internal disputes due to the neglect of local obligations (Brumbaugh 1980b: 68; Jorgensen 1981: 161). Consequently, establishment of new ties through marriage was not a common objective (Brumbaugh 1980b: 103-104). Although Ruth Craig (1969: 178, Table 1) reports that thirty-two percent of Telefolmin marriages were outside the parish, it must be

noted, however, that where such marriages took place, women rarely moved beyond a neighbouring parish and less than seven percent were inter-tribal marriages.

Jorgensen (1981: 224-225) has suggested that the intensity and direction of inter-community marriages may have had a lot to do with demographics and that exchanges were infrequently reciprocated. Not only were larger villages able to pursue 'endogamous policies' but they could draw in women from smaller communities which, while having a preference for endogamy, were unable to prevent the drain of marriageable women. In such circumstances, disproportion in the amount of exogamous to endogamous marriages may have been a precursor to a community's disintegration and the absorption of its remnant population by larger communities.

CNG fringe groups, such as the Baktamanmin and Mianmin, which had smaller and more dispersed communities, were also largely endogamous but as previously mentioned they did have descent-based exogamous units. Members of different clans or lineages, as with the Amanab, co-resided in hamlets and often had members living in more than one hamlet. Barth (1975) reported that the Baktamanmin parish of five hamlets, with a total population of around two hundred persons, had eleven named exogamic clans, these being about the same size as those of the Amanab which had a relatively similar population structure and settlement pattern.

The small membership of clans was a reflection of the shallow agnatic structure of many CNG societies.[65] Marriage between these clans was a function of the settlement pattern whereby, as in the more diffuse residential patterns found in the western Border Mountains, members of small agnatic units were spread across the clustered hamlets. Barth (1975: 145) reports that ten to fifteen percent of the Baktamanmin population were not born locally, but it seems that most of these were immigrants rather than in-marrying individuals, and that Baktaman was more or less a closed connubium. Morren (1986: 243) observed a similar pattern for the Mianmin:

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[65] It has been suggested that the Baktamanmin exogamous descent units were anachronisms—a legacy from when they were a more diffuse population (Barth 1975: 253).

Because of the endogamous character of most marriages and the nonlocal or ambilocal nature of the lineages that regulate it, marriage…..does not appear to be as important a vehicle for geographic or social mobility as it is in other societies.

For Bimin-Kuskusmin in the eastern CNG fringe region, marriage exchange was far more regulated. Their system involved direct exchanges between patriclans belonging to opposite moieties (Poole 1976: 494-8). The Bimin-Kuskusmin population, approximately 600-650 at the time of Poole's fieldwork, formed the largest connubium and probably the largest inclusive social unit in the study area.[66] Poole noted some preference for matrilateral cross-cousins emerging counter to the moiety system. He also noted a growing tendency for patrilineages to exchange within the clan unit and, like many Mountain Ok groups, the Bimin included bride-wealth in their marriage arrangements (Poole 1976: 495). Some marriage exchange was reported to have taken place with Oksapmin clans to the north, but the majority of Bimin-Oksapmin marriages appear to have involved Oksapmin clans that had migrated into Bimin territory and had become affiliated with either of the moieties (Poole 1976: 417). The number of women who married outside of Bimin were predominantly from immigrant clans who maintained exchange ties with allied clans in neighbouring groups (Poole 1976: 416, 419).

In line with the diffuse nature of clan membership, the Oksapmin parishes appear to have been the most exogamous of all CNG groups and it is likely that the average distance that Oksapmin women moved through marriage was the greatest for the study area. Perey (1973: 86) reported that fifty percent of marriages involved women from other parishes. Although male uxorilocality within the parish was high, extra-parish uxorilocal marriage appears to have been low. Perey (1973: 86) reports that only five percent of males in Gwe parish were born outside the parish, which is surprising considering the diffuse nature of clan membership.[67]

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[66] 1979 patrol officer census figures had the Bimin population at 648, as cited in Weeks (1981: 101).
[67] Pouwer (1964: 138) paints a similar picture for Ngalum marriage and claims that extra-regional marriage exchange was a foundation for ties between groups living in the Star Mountains.

11.5 Discussion

A review of the ethnography suggests that the small exogamic segments, the bilateral nature of kinship, the lax definition or compliance to marriage taboos, and the tenuous nature of communal unity all contributed to a situation where affinal ties and filiative ties were somewhat superimposed. It seems as though the majority of marriages did take place within such a network of ties, regardless of whether communities were composed of clans, lineages or kindreds. Indeed, in many circumstances restricted connubial spheres may have been seen as not only more expedient but also as vital for maintaining security and demographic viability (Jorgensen 1981: 223; Juillerat 1996: 291, 298).

A macro-scale view would therefore provide a picture whereby women were either alternately exchanged between small contiguous communities or where the majority of exchanges took place between small exogamous units within a larger community. Communities at some distance from linguistic boundaries would therefore rarely have had an opportunity to undertake marriage exchanges with communities that spoke a different language.

Where there was some concentration of exogamous marriage ties, these were inevitably followed by some residential aggregation of segments belonging to the communities involved. Beside the example provided by Bragge mentioned in the previous chapter there is plenty of anecdotal evidence that larger communities were constituted according to relationships activated through matrilateral and affinal ties linking men (Craig 2008; Gell: 1975: 38-39; Huber 1974: 110; Kelm & Kelm 1980: 221-2).

Taking this into account, it must be considered that most movement of women was accompanied, or rather followed by, movement of men. Some of this movement may have involved uxorilocal marriages but more commonly male migration was simply a part of the movement of social segments between settlements.

12. Trade and exchange

12.1 Introduction

The pervasive networks of exchange and social ties described for the North Coast by Welsch and Terrell (1998) are not found in all regions of New Guinea where communities speaking significantly different languages live in close proximity. Linguistic and cultural diversity is common in complex geographies and environments, which is not surprising as complex geography can affect the degree to which groups maintain social contact, and communities tend to develop subsistence regimes that suit particular environmental niches (Barth 1969). In such circumstances more elements of culture are likely to be autochthonous.

On the other hand, complex geography provides different environments with different exploitable resources. Thus some communities may seek to obtain such resources and goods made from such materials from neighbouring groups. The study area includes several relatively homogeneous environments (eg. the riverine, swampy areas of the upper Sepik and the inter-montane valleys of the highlands) but mobility across these regions varies significantly where the topography is especially rugged, or swampy and forest unbroken. It has often been reported of highlands people that very few individuals would travel beyond their valley, or a neighbouring valley, in their lifetime (e.g. Barth 1971: 179). To complicate the geographical challenges, there was often general antagonism, and suspicion or real fear of sorcery and violence, between communities (e.g. Craig 2008; Gell 1975: 31). Early patrol reports claim that individuals consciously weighed the risks involved in travelling beyond their settlement's territory or that of a neighbouring community with whom they had significant ties and favourable relations (Read 1962: 6). Even by the time anthropologists had started working in the Upper Sepik, people would rarely risk a return journey that took longer than a day (Barry Craig pers. comm. 2005).

There are considerable data concerning trade, and the products and resources that were being exchanged, around the time the collections were made in CNG, but somewhat less for the USB. It is clear that the trade networks were less extensive than for the North Coast (facilitated as it was by sea-going canoes) and involved fewer resources and products. In the study area, the resources and products with

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trade potential were more limited and, as previously mentioned, the materials used to make most artefacts, as well as the skills required to make them, were relatively ubiquitous.

As previously discussed, in both the lowland and highland regions, personal incentives for exchange were relatively undeveloped so valuables had a limited utility. Beyond being used to purchase essential resources and products, valuables were predominantly used as compensatory gifts or as brideprice, and even then the practice of brideprice had limited expression in most of these societies (Gell 1975: 27; Guddemi 1992a: 310; Huber 1974: 168; Morren 1986: 181).

12.2 Economic structures and exchange

In a recent study of the dissemination of linguistic elements in NCNG – an area which includes a section of the North Coast, the coastal (Bewani) range, and a section of the USB that falls within the study region of this particular project – Donohue and Crowther (2005) argued that economic structures were crucial in determining the scope and pattern of interaction that existed within a region. Donohue and Crowther (2005: 170) concluded that the subsistence systems of NCNG were not conducive to the establishment of trade networks and that this in turn limited the incentives for interaction:

> …sago cultures in geographically non-differentiated areas do not produce trade cultures. Domicultural patterns of gardening, as opposed to agricultural ones, do not produce the level of yields to make surpluses available for trade…. the lack of valued trade products and the isolated dwelling patterns have led to little, and in some cases no, cultural interaction with other groups. This has dampened the spread of ceremonial knowledge or cultural artefacts.

In part agreement, Townsend (1969: 109), with reference to the Sanio-Hiowe, believes that although the production of a surplus of processed sago could easily be achieved, it was the mobility of small sago-consuming societies and the relatively limited exchange value of sago that led such societies to invest surpluses into 'leisure' and inter-community feasting. Societies such as the Sanio-Hiowe and those of NCNG, with their low-intensity gardening regimes of diverse cultivars, had

subsistence and settlement patterns that were more or less analogous to the lowland communities of the USB.

However, it is still apparent that, while the kinds of commodities and valuables that were exchanged were not numerous, or traded in large quantities, some items were traded across considerable distances and traversed the entire region. Just as importantly, some communities exhibited preferences for particular kinds of traded goods and these preferences offer clues about the existence of social ties or cultural differences among the various populations within the study area. (Appendix 22 for photographs of some of the trade products discussed in the following).

12.3 CNG

In contrast to New Guinea's lowlands, large integrated exchange systems were a common feature in the highlands of New Guinea. In particular, the *moka* of the Melpa and the tee of the Enga, were ceremonial exchange systems linking a large number of clans that facilitated a coordinated movement of a great volume of trade goods over a considerable distance (Feil 1980; 1982; Meggit 1974; Wiessner & Tumu 1998). The *tee* cycle was based on the successive channelling of pigs east to west across the system, culminating in a phase where a proportion of the pigs were slaughtered and the meat returned west to east across the system; other valuables were drawn into this system of pork exchange. On the other hand the *moka* involved a chainlike sequence of delayed reciprocities between members of different clans. Gifts, involving pearl shell as the major currency, but also pigs, were made in anticipation of receiving goods of a higher value, thus providing impetus for the system.

These large integrated highlands exchange systems were made possible through the cultivation of sweet potato and a consequent intensification of horticulture, which in turn produced a surplus of domestic pigs. The production of large quantities of pork provided a readily exchangeable commodity and precipitated a greater flow of other wealth and trade goods through the system. Relatively large human populations coupled with the significant surplus in pork required extensive networks of reciprocity. In turn a feature of these cycles was the incorporation of ceremonies involving hundreds or even thousands of individuals and it was through these

ceremonial exchanges that pork and valuables were distributed, providing an increased impetus for participation. Just as important was the role of 'big men' who gained influence within their own communities by manipulating the system to secure pigs and wealth for themselves and fellow clan members.

The trading networks of the highlands of CNG were not at all like those described above. They did not operate as a single integrated system with cycles or phases of exchange; they did not include inter-regional participation in gift-giving ceremonies, nor exhibit the long-range delayed reciprocity that is a feature of those other systems. Further, because there was no need to coordinate large communities in the accumulation and distribution of wealth, there was no function that would normally be associated with the role of the 'big men' who were so characteristic of these other highland societies (Strathern 1966).

Pigs were never a plentiful commodity in CNG and played a relatively minor role in exchange. As has been discussed above, most of the highland and mid-altitude groups had only partially adopted sweet potato and, while others had made sweet potato their main staple, it had not led to significant intensification or changes in subsistence strategies resulting in surpluses needed to achieve large integrated systems such as those described above. Exchange in CNG consisted of numerous and relatively autonomous bartering relationships that were initiated by individuals to maintain the supply of a range of crucial utilitarian items, basic commodities, and a limited range of valuables. The region did manifest spheres of localised exchange, where resources and goods were consistently sought by groups from particular sources, and these were intersected by long range networks involving down-the-line exchanges, but they were not coordinated in any meaningful way (Brumbaugh 1980b: 32-35; Cranstone 1971; 1990; Hyndman & Morren 1990; Swadling 1983). Communities would often wait for traders to come or individuals would irregularly initiate trading parties and these were usually small and would rarely travel more than two or three days from their settlement.

Nevertheless essential goods and valuables did move through the network. Rappaport's (1968: 106) assessment of the role of valuables and subsidiary exchange goods in the trading system of the Maring, a highland fringe group of the

Bismarck Range, serves to exemplify the way in which trade operated throughout CNG:

> Trade among the Maring is effected through direct exchanges between individuals. It may be questioned whether a direct exchange apparatus that moves only two or three items critical to subsistence would be viable. If native salt and working adzes were the only items moving along a trade route, or were the only items freely exchangeable for each other, sufficient supplies of both might be jeopardised merely by inequities in production. Insufficiencies would develop because the production of each of the two commodities would not be determined by the demand for that commodity, but by the demand for the commodity for which it was exchanged.

In essence trade in CNG draws more parallels with highland fringe systems described for other parts of New Guinea, in that numerous and independent interpersonal relationships, along with a host of diverse economic imperatives, work together to draw goods through the system.

Swadling (1983: 113-14) provides some detail about how trade was undertaken in CNG. According to Telefolmin informants, large annual trading expeditions could involve five or more men, could travel as far as fifty kilometres from home and take a week or more. On the other hand, more frequent trading expeditions with neighbouring groups, would only involve two or three men and take a few days Exchanges could involve a diversity of goods. For example, a party of Telefolmin, trading with the Atbalmin, their most distant trading partners to the west, would use a range of exchange goods that they had obtained from neighbours who had access to other lines of exchange and resources (Swadling 1983: 114). The ecological diversity between the highland core and fringe areas, and the ability of core groups such as the Telefolmin and Tifalmin to intensively cultivate large quantities of quality tobacco, provided the means to activate an array of trade options. The products could then be channelled west to draw adzes and valuables eastwards into the system (Cranstone 1990: 52; Kooijman 1962: 31).

Another factor that kept commodities flowing through the system was that the two most important kinds of shell wealth became increasingly valuable as they moved in

opposite directions along the east-west axis of the highlands from the points at which they entered the system (Bercovitch 1989: 258; Brumbaugh 1980b: 32); however, these goods did not pass directly from west to east or vice versa. The enmity between neighbouring highland groups who shared similar environments stifled trade between such groups. Rather, the movement of goods was maintained by the exchange of goods between the core and fringe groups to the south, north and west and fringe groups would then redirect goods back into other parts of the core. In the process, all core groups were accessing products from more than one fringe group. This was not only the case for adzes and some shell wealth but also other externally derived products such as ash salt from east of the Strickland River which entered the system via the Oksapmin, travelled south to the Faiwolmin and then back up to the Telefolmin (Barth 1975: 57; Brumbaugh 1980b: 33; Jackson in Weeks 1981: 37; Perey 1973: 60).

Fringe groups on the slopes also provided resources from their territory and the neighbouring lowlands, the most important being palmwood, commonly in the form of bow staves. Palmwood was crucial for the local trade network, and was the lowland counterpart to highland tobacco (Brumbaugh 1980b: 34; Cranstone 1990: 52; Eggertsson 1997: 25; Jorgensen 1981: 69, 209).

The core group at the east of the system, the Oksapmin, did not develop the intensive cultivation of tobacco and they relied on being middlemen, channelling a range of products to and from groups in the south and north. Their key trading items were stone adzes (A variety the Telefolmin called *mok*), which they sourced from the upper Leonhard Schultze River in the north. These adzes enabled them to trade with fringe groups to the south, Bimin and Faiwolmin, from whom they obtained palmwood bow staves (Eggertsson 1997: unpaged; Perey 1973: 60; Poole 1976: 592; Swadling 1983: 82)

One particularly interesting feature about trade between the core and the fringe groups on the slopes was the supply of piglets into the system. While pig husbandry was more intensive in the highland core it seems that the flow of pigs was greater into the core than out of the core (Perey 1973: 61; Swadling 1983: 114). The loss of hunting lands due to increased population density and reliance on gardening meant

that highland core groups had restricted access to wild pigs (Craig 1990a: 197-8, Fig.15.3) and therefore captured piglets were a viable exchange item for the fringe groups who had better supplies of game.

Apart from bows, the only other local product extensively traded within CNG were string bags, which were an important component of brideprice and provided additional currency for the purchase of valuables travelling through the system, and were commonly traded (Brumbaugh 1980b: 34). Some string bags, especially feathered string bags used for initiation, were quite valuable and were often purchased outright with tobacco and other local products (Swadling 1983: 111; Cranstone 1964c; Hyndman undated).

Arrows were made by all groups but those made by other groups were actively sought. There is not much evidence that they were used extensively as trade items but certainly as gifts between trading partners or friends (Barth 1975: 233; Barry Craig pers. comm. 2006; Cranstone 1990: 53). The only direct evidence for specialisation involved the production of hand drums by the Atbalmin in the west and these were traded east into the system (Cranstone 1990: 52; Eggertsson 1997: unpaged). Lesser examples of specialisation included bark capes, which were commonly made by the Wopkeimin and traded to many other highland groups (Cranstone 1990: 52; Hyndman undated).

The trade in adzes was probably the most important feature of Highland exchange. The mountain ranges of CNG are composed of limestone and surface exposures of the type of stone suitable for making adze blades are rare. There were two important sources of finished but unhafted adze blades involving two distinct types of stone and adze forms.

Adzes from the west are made from a greyish blue-green unmetamorphosed igneous basalt/andesite sourced from quarries near the headwaters of the Brazza River in territory belonging to Uma and Kimyal speakers in the Central Highlands of [West] Papua some three hundred kilometres from the area of the CNG highland core where their use predominates (Hampton 1999: 251). The finished adze blades, known to the Telefol as *fubi*, are long, tapering and narrow with a pronounced

dorsal plane that forms a triangular or plano-convex cross-section. They were traded into the region via the Atbalmin groups to the west, and to a lesser extent via the Wopkeimin in the southwest.

Adzes from the northeast (*mok*) are made from black-brown gufug gneiss originating from the headwaters of the Wario (Leonhard Schultze) River, in the northern slopes of the Schatteburg Mountains (Swadling 1983: 79-84). These broad and relatively flat adzes have a long oval or slightly bi-convex cross-section. This adze was traded to the Oksapmin in the eastern part of the highland core via communities in the Om Valley (Perey 1973: 60). It was also obtained by the Telefolmin from the Tuwari, who are believed to have fashioned them, or via the Dulanmin (Swadling 1983: 114).[68]

Cowrie shells were strung and used for brideprice in CNG. Cowries were obtained by the Telefolmin and other Mountain Ok groups from the north via the Om River groups (Brumbaugh 1980b: 33). The only other shell goods obtained from the north were pearl shells which could be traded west for greater profit, but these were rare and extremely valuable (Brumbaugh 1980b: 33). There is also evidence that some cowrie shells were obtained from the south via Lowland Ok groups (Craig 1983; Swadling 1983: 114; Eggertsson 1997). *Nassa* shells were an important if not essential part of brideprice for many Mountain Ok communities (Brumbaugh 1980b: 38). Brumbaugh (1980b: 32) and Jones (1980: 17) indicate that the Mountain Ok obtained their *Nassa* shells from the west and southwest via the Atbalmin and Wopkeimin. This trade was extended via the Faiwolmin to Bimin communities in the east (Eggertson 1997; Poole 1976: 585). The Atbalmin appear to have got their supply of *Nassa* from groups to the southwest. These shells were

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[68] One other adze type (*bangkele*) traded in Central New Guinea was limited to Mianmin groups; there is little evidence of any trade in these adzes involved other Mountain Ok populations. It is possible due to the long lasting enmity between the Mianmin and the Telefolmin and Atbalmin populations to their south. According to Morren (1986: 271) this occurred between 1910 and 1920 when disputes and minor skirmishes were followed by an aggressive Telefolmin expansion into the northern fringe of the Hak Valley. A Telefolmin informant recalled the most recent Telefolmin trading party to visit the Mianmin as occurring around 1914 and it involved the exchange of tobacco for bows, string bags and cowries from the Mianmin; there is no mention of adzes (Swadling 1983: 114). The only adze in the sample from the Telefolmin that was reported to be of Mianmin origin, and appeared to be of the form made there, was taken during a raid on a Mianmin community (Craig 1983). Besides, Morren (1986: 269) reports that the Mianmin gained access to the stone quarry when they started to make incursions and settle in territory formerly held by lowland groups and presumably this occurred after the breakdown in relations with the Telefolmin.

almost certainly sourced from somewhere in [West] Papua, probably from the south coast (Swadling 1983: 116; Bercovitch 1989: 258).[69]

Less valuable shells such as fresh water mussels were also traded into the highlands. Swadling (1983: 114) reports that mussel shell rattles were traded in from the west and from Lowland Ok groups in the south via the Mountain Ok groups on the southern slopes and this concurs with Hyndman's (undated) observations for the Wopkeimin. Whole conus shells, and rings made from the tops, were also not uncommon and these were likely to have come from the north (see below).

A certain amount of small scale and localised trade arose from differences in available resources. Morren (1986: 165) describes how relationships of exchange among Mianmin communities and parishes were activated by these irregular distributions of resources:

> Particular parishes are known for their possession of important resources or the manufacture of articles with them. Sokaten, which characteristically occupies a somewhat higher altitudinal range…..than other eastern parishes, is known for the 'black palm' used in the manufacture of bows. Wameten ….. is known for two varieties of cane, one used for arrow shafts, the other for belts and arrow bindings. Mabweten….. provides a special palmwood for making barbed arrow points from the Aki River area…... Stone for adzes was collected from a quarry on one of the headwater tributaries of the Usake River…..Raw materials may be collected without compensation, but finished manufactured articles are bought or bartered.

Hyndman's (undated) collection notes suggest that a similar pattern of local resource management was typical for the southern highland fringe area. For example, individual women in one community may have ownership of particular stands of sedge, used to make skirts, that grow nearby and this would be sourced by other women from both within their community and other communities within the parish or in a neighbouring parish.

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[69] Reynders (1962: 49) reports a major trade route from the lowlands in the south of [West] Papua to the Star Mountains and extending northeast to the Sepik Basin.

12.4 The USB and the Border Mountains

It appears that subsistence produce was the most important trade item for hills and plains communities. Although sago was not an important trade item, some sago, and more importantly, meat were used to trade for valuables such as shells and beads coming into the region (Huber 1974: 38; Juillerat 1996: 222; Kelm & Kelm 1980: 219). Riverine communities had the extra benefit of having access to fish and used fish to purchase garden produce, meat and wild foods from plains or hill communities as well as locally made products such as arrows and string bags (Craig 1968a–throughout his collection notes Craig provides such information equally for relevant objects so references to 1968a and 1969a should be from now on be considered as *passim*; Craig 1969a; Guddemi 1992a: 310; Kelm & Kelm 1980: 219).

Less information has been published concerning the organisation of exchange in the USB and Border Mountains compared to that for CNG. Members of contiguous villages who were linked by affinal and matrilineal ties could conceivably make exchanges fairly regularly on a one-to-one basis. Huber (1974: 38) describes such a relationship between a Border Mountains community and a plains community ten to twelve kilometres away:

> Wamu…..does occasionally participate in food exchanges which involve a short daytime meeting and parley between parties from each village at some midway point. Such exchanges are a traditional form of inter-village transaction, organized by related parties in each respective village, and arising primarily in situations where neighbouring villages find themselves in complementary states of abundance and scarcity (e.g. nuts may be exchanged for fish). With respect to the Dawol [Biaka], exchange seems to involve Anggor agricultural products for Dawol forest resources.

Sometimes transactions between distant communities were necessary to access more exotic goods. Trading parties in the lowlands were largest for riverine groups and parties were known to travel up to thirty kilometres along the river. Craig (1973: 7/2) records a party of canoes that travelled from the Idam River to the Dio River, another tributary of the Sepik, where they obtained shell rings and meat.

Juillerat (1996: 222-230) provides the best data for trade within the Border Mountains. Essentially, groups not linked through connubial relations sometimes established exchange ties. The most well know of these were the *sêh* or *sehe* relationship recorded for the Amanab and Waina respectively (Juillerat 1996: 225; Gell 1975: 25). Expeditions were undertaken once or twice a year between the participating communities and these were made not only to secure goods of which there was no other available source but also to maintain a ring of security around a group of communities with close ties. The distance at which exchanges occurred were not as great as those travelled by riverine groups, being mostly less than ten kilometres (Juillerat 1996: 229, Map 3). Most commonly traded within the broader community and between *sêh* partners was stone for sago cutters and scrapers, but more important items, including string bags, furs and even hand drums, which the Iafar were specialised in making, were traded for shells, beads and steel axes coming into the system. Importantly, as in CNG bows and arrows were exchanged between *sêh* partners.

Trade between the communities of the USB and CNG was almost non-existent apart from some minor trade occurring between lowland Abau groups on the east side of the Sepik and communities in the West Range, and between Pyu-speaking communities living along the western bank of the Sepik's course where it passes into [West] Papua, and the foothills north of the Sibil Valley. The latter trade involved well-used shortened *fubi* adzes, some of which reached the Idam and Simaiya valleys of the Abau and Amto (Craig 1968a; 1969a; 1973). How far this trade in second hand adzes extended is not clear; however, Kelm and Kelm (1980: 218) assumed that adzes from the western course of the Sepik were once traded to Amanab and from there across the North and Sand rivers to Yellow River communities, or directly into the Torricelli Mountains to Wape. Barry Craig (2007 pers. comm.) collected *fubi* and three *mok* adze blades at Kambragambra on the lower Sepik in 1983 that were thought to have arrived there via the southern tributaries of the Sepik.

A similar trajectory of trade existed for limestone, or calcite, nose pins, because much of the stone and finished product came from inside [West] Papua, filtering through to the southwest region of the USB and to the Border Mountains (Craig

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1968a.; 1969a) These nose-pins were likely a traditional [West] Papuan cultural form that spread to Papua New Guinea, as informants pointed to their origin being the Star Mountains. Both Kooijman (1962: 19) and Mitton (1972: 8 -9 [cited in Swadling 1983: 107]) report that major sources of the stone are found in the upper Ok Bon and Ok Birim rivers some twenty to thirty kilometres into [West] Papua near Mt Antares, probably in territory inhabited by Iwur speakers. Craig's (1968a) Abau informants indicate that the nose-pins, or maybe the stone used to make them, had come from the Tsop River, a tributary of the Digul inhabited by Ngalum speakers, but it is unclear whether this was the source of the stone or the route through which the stone was traded.

In return for these commodities, quantities of dogs' teeth were carried south up the Sepik, supplemented by trade in items such as arrows, sago, meat from game animals and, in more recent times, European goods such as matches and bush knives (Craig 1968a; 1969a; 1973). Some commodities such as dogs' teeth eventually made it to the highlands where they were considered most valuable (Kooijman 1962: 19). Highland groups also sourced dogs' teeth from lowland groups to the south (Cranstone 1964b).

Aside from the few adzes coming into the USB from the south-west, most adzes and stone sago cutters were made locally. The upper courses of tributaries flowing from the West Range and from the Bewani, Border and Torricelli mountains into the Basin, provided stone of sufficient quality for local populations to manufacture their own tools. In the west of the Basin, the Abau, and the Amto-Musian populations on the northern edge of the West Range, made adzes and stone sago cutters from local river stones in the upper reaches of the August and Simaiya rivers and from the western tributaries of the Sepik in [West] Papua (Craig 1973: 5/17)[70]

Border Mountains communities all relied on local stone. Craig (1968a; 1969a) reports Anggor informants claiming their ancestors and local men made adzes and both Peter (undated) and Craig (1968a: 5/17) report Yuri communities utilising stone from the upper reaches of Green River. The Amanab communities

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[70] In 1968, Craig recorded on 16mm cine film the manufacture of four stone axe-adze blades at Bibiyun on the upper August River. These were made from river pebbles.

manufactured a distinctive adze form with a very rounded dorsal plane and convex cutting edge (Juillerat undated). This tradition was divided into two distinctive adze forms, for the central and the northern Amanab groups and for the Kwomtari communities on the plains to the east. Contrary to Kelm and Kelm's theory concerning the flow of adzes east into the Yellow River region, information provided by Craig's (1969a) Namie informants implies that local rivers, including the upper reaches of the Yellow River and adjacent creeks, were common sources of stone for the Namie; Ak and Awun communities also would have had access to these sources.

The trade in shells represents an important part of exchange throughout most of the area and there were two directions from which shells entered the Plains and Border Mountains: from the North Coast across the western Torricelli Mountains, especially through the Lumi area; and north-eastwards from [West] Papua. In the USB, shell rings made from Conus sp. were an important valuable and used for brideprice by the Sepik River and Yellow River communities, as well as by Amanab communities in the Border Mountains, and by northern plains groups such as the Kwomtari.

Cowrie shells were an important valuable among the Sepik and Yellow River communities also, and to a lesser extent the Border Mountains communities, where they were used as valuables or worn as decoration. There were no cowrie shells recorded for the Waina in the sample and this reflects Gell's (1975: 18) assertion that shell valuables did not feature in the Waina economy. Shell rings were the only shell valuables collected from the Anggor, for whom there is also limited evidence for bride purchase (Huber 1974: 168). It appears that both the shell rings and cowrie shells were traded into the northern plains of the USB and Yellow River area from the north coast via the Torricelli Mountains. Some shell rings were then traded south and west and a few examples are recorded for the Abau, who used them as brideprice (Craig 1969a, 1973: 7/5; Kelm undated; Kelm & Kelm 1980: 219).

The eastern communities of the Amanab were the only Border Mountains' group recorded as using shell rings for bride price, for both intra-community marriages

and for marriage with Baibai and Kwomtari communities in the plains to the east.[71] As Juillerat (undated) records that the Baibai and Kwomtari to the east were the source of the shell rings, who in turn obtained them from people in the Torricellis, it seems likely that the practice of using shell rings for brideprice was adopted by the Amanab communities as a consequence of marriage exchanges with these groups. Craig (1969a) also reports another eastern plains language group – the Nagatman – using shell rings for brideprice; they also were also sourced from the north coast via the western Torricelli Mountains.

It is interesting that *Nassa* shells were more important, indeed essential for bride price, among Yuri and Dera communities than for other Border Mountains or USB groups (Borok 1965: 11; Cottle 1953: 6; Geyle 1954:6). This limited distribution, in the west and south-west regions of the Border Mountains, along with the fact that from this area, access to the plains communities in the east would have been restricted, suggests that their trade was almost exclusively from the west. Craig (1973: 7/5) reports that *Nassa* were extremely rare in the Abau area, although the Yellow River communities to the east appear to have sourced *Nassa*, which they used not for bride price but to decorate headbands worn by men at ceremonies (Craig 1969a; Kelm & Kelm 1980: 190). These were also obtained via the Torricellis with the other shell material but were not traded further to west or into CNG.

12.5 Discussion

While the exchange of goods between groups was not pronounced there were several products that originated from outside of the study area and were traded extensively through the system. The movement of these products transcended local spheres of exchange and drew more local products into the system. There is evidence that in each of the three regions, trading parties involving men routinely travelled beyond the ring of contiguous communities to trade with other groups. The longest exhibitions were undertaken in CNG where there was a greater dependency on exchange networks for essential products and resources such as palmwood and stone adzes as well as shell wealth needed for marriage exchange. In the USB and

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[71] They also used them to pay craftsmen who made ritual masks (Juillerat undated).

Border Mountains exchange was not as crucial as there were local sources for most of the essential resources. Nevertheless, traditionally there appears to have been some exchange of foods, especially those irregularly distributed. With this exchange it appears that locally made products, including string bags and arrows, and some valuables originating from more distant places were also exchanged.

With the increasing colonial influence after World War Two, shell wealth, steel axes and other western products encouraged greater trade activity in the region. Although the distances at which exchange partners travelled appear to have remained relatively small it is clear that in the USB and the Border Mountains, men were willing to travel one or two villages beyond those that other members of their villages were willing to visit to access certain goods and that this was the case well before the collections were made.

13. Ritual and cultural transmission

13.1 Introduction

Margaret Mead (1970: 13), after observing the facility with which the Mountain Arapesh assimilated foreign cultural traits, concluded that they and the neighbouring peoples of the middle Sepik plains formed a 'culture area' where there was a 'self-conscious diffusion of non-material traits, coupled with a premium upon new importations'. Although goods and products were channelled through extensive trade routes that traversed the Prince Alexander and Torricelli Mountains, she concluded that resource procurement and craft production were mostly local affairs and that for the Arapesh these were, more importantly, avenues that provided access to non-local idioms. It was not the products per se that were important but the novel, innovative and exotic (Mead 1970: 192-193).

For the Arapesh and other Sepik societies that inhabited transitional or fringe environments between large ecological zones, it was common to borrow all manner of cultural practices such as techniques of making pots and string bags, performing ritual, magic and songs, and even new methods of undertaking important subsistence activities such as fishing or pig hunting (Mead 1970: 196).

The modes of acquisition also were diverse. Sometimes practices were transmitted via a simple process of observation in one location followed by replication in another, while more complex ideas were gifted and even sold (see also Harrison 1993). These were quickly passed on to neighbouring communities. Importantly, this commoditisation of culture was often partitive. Complex cultural forms such as rituals and ceremonies were passed on not only as complete programs but components could be transmitted separately and then recombined with other elements (Mead 1970: 197-200).

For Mead, this dynamic pattern of cultural exchange had a profound effect on the region's cultural-linguistic picture:

> The whole area…exhibits every evidence of centuries of cross-currents of contact and shifts in material culture and social custom. Consequently, each linguistic group has become, in some measure, representative of the more

general cultures of the region and gives very little evidence of its original cultural affiliations or type of habitat (Mead 1970: 14).

Since Mead's seminal work, the cultural picture of the Sepik has been explained according to this predisposition to purchase, appropriate, sell and recycle and as being 'continually reaffirmed and recalibrated' by an aggregate of exchanges that are 'isolated and trivial' (Tuzin 1990: 365). It has been argued that regional affinities are not evidence of cultural integration, but rather as testaments to the 'overall congruence' of the Sepik's socio-cultural configurations (Harrison 1987: 492-3), the wealth and interchangeability of the region's linguistic and cultural elements (Filer 1990), and the ubiquity of the 'cultural mechanisms' that readily 'transliterate' cultural elements during diffusion (Tuzin 1990: 365).

One of the features of Sepik society seen as facilitating the dynamic pattern of cultural transmission is the flexibility of social relationships. As Foley (1986: 21-22) suggests, this led to an 'other-directed' consciousness as communities had relatively weak internal focus. This put a premium on non-local forms and ideas while undermining the tendency to place high social value on local idioms. The distinctiveness of a community's culture was therefore more likely to be determined by its spatial position within the region's network rather than by local cultural predispositions. Where trade in material goods was not significant, many of the nodes of interaction would be short lived, or only sporadically activated, because they were reliant on inter-personal relationships that fade within a generation or two (Foley 1986: 26). Indeed Mead (1970: 21) called these 'inexplicit' social processes, which led her to suggest that such a cultural picture may be impossible to interpret according to an historical framework:

> …..when we find similarities among groups that have been studied, we have difficulties in relating them to various kinds of contact, trade, migration, temporary flight from enemies or long – or short term – residence in a locality (Mead 1978: 71).

Aside from parts of the highlands, we have established that for much of the study area, with the exception of exchange involving stone tools, small quantities of shell valuables and food, there was no great economic incentive for groups to interact.

Nevertheless, as Gell (1975: 25) pointed out, people were eager to interact and the motivation was more social than economic.

13.2 The importance of ritual to social integration and interaction

The role that ritual played, and in some cases still plays, in the configuration and maintenance of New Guinea societies, has been discussed extensively in the last few decades. Debate has centred upon the degree to which ritual provided an ideational foundation for society as a counter to the individualism and volatility common to social life (Harrison 1985). A problem for those exploring such questions is that ritual programs across New Guinea demonstrated great variability and complexity of formal exegesis (Barth 1987; Brunton 1980). Also, the social categories and hierarchies that ritual activities mobilised were largely redundant in everyday life and easily subverted by everyday concerns (Harrison 1985: 416; Juillerat 1992b: 93).

Nevertheless, as Morren (1986) has pointed out, ritual provided society with a means for marking the natural perturbations of the communal unit and its subsistence regime. Rituals had a 'measurable effect' on people and their relations with 'other human and non-human populations in [their] environment' and could be viewed as being 'equilibrational' or 'escalatory' in their effect (Morren 1986: 205). Ritual affirmed the collective social order by reifying the communal unit according to a cosmologic frame and enabling its participation in important cycles of natural fertility (Juillerat 1992b).

Ritual also emphasised boundaries between the social sphere of the community and that of the 'extra-social', one which was inhabited by spirits, strangers and, significantly, sorcerers who invariably inhabited neighbouring villages (Harrison 1985: 417; Huber 1980: 44). Ritual was, and sometimes still is, the pre-eminent expression of collective action and, as Harrison (1985: 417-419) points out, 'contextually [enables] a structure of social relations' for people within a community, and for those in other communities with whom they share ties (Gell 1975: 175, 189; Huber 1974: 209; Knauft 1985: 325, 333).

13.3 Men and ritual

Ritual throughout New Guinea was and is almost exclusively a male activity. Much discussion has focussed on societies whose rituals, particularly initiation rites, provided men with a means to assert masculine and agnatic principles they believed to be crucial to the continuity of their community (e.g. Allen 1967; Langness 1974). Most importantly, it has been argued that it enabled men to counter and subvert the dominance of women in production and reproduction and domestic relationships with women which were regarded as antisocial (Brumbaugh 1980b: 71; Harrison 1985: 414; Whitehead 1986a; 1986b).

While there was considerable variation in the degree to which male hierarchies, inherent in cult structures and possession of esoteric knowledge, were able to intrude into the profane (Harrison 1990; 1993: 139; Juillerat 1991; Whitehead 1986b: 272), men considered their esoteric knowledge necessary for the perpetuation of masculinity and, by extension, culture and society. For men it was one of the few means by which prestige could be achieved (Harrison 1993: 154).

Of particular relevance to this study is that it was the men who sourced ritual forms and elements, and it was their political and social activities that resulted in permutations of ritual forms. Because the metaphysical realm was inhabited with a raft of spirits and ancestors who intervened in matters such as gardening, hunting and the maintenance of natural and human fecundity (Huber 1990: 151), it is arguable that the desire for the most efficacious outcomes provided much of the incentive behind the sourcing and innovation of ritual techniques.

13.4 Ritual in the Upper Sepik

Unlike warfare, ritual activity was still evident in the study area at the time the collections were made and many fieldworkers observed one or more ritual events. Indeed, apart from missionary activity resulting in some suppression of ritual activity at some localities, it is arguable that ritual activity increased as inter-village contact became easier and safer as a result of the *pax Australiana* (Dewar 1967: 19; Hutchings 1968: 2-3).

As with many other Sepik groups, those within the study area placed great emphasis on esoteric and ritual knowledge (c.f. Harrison 1993: 141-142). The result of this was that, aside from ritual participation, motivated men actively sought ritual techniques and forms from other communities; consequently, rites, liturgical programs and ritual paraphernalia became important exchange items (Gell 1975: 25; Huber 1990: 157). Even in CNG, where there was a relatively conservative cult ideology and where ritual configuration and categories intruded further into the mundane arena of communal life to the extent that it directed the configuration of settlements, liturgy was somewhat open to introduced forms; some communities dealt with the loss of ritual knowledge (for example, through the untimely death of a ritual expert – Barth 1987: 48) by requesting the help of cult leaders in neighbouring communities (Barth 1975: 95), while some changes or differences in liturgy were introduced by refugees from other groups (Eggertsson 2003: 30).

It is not surprising therefore that there were widespread affinities in ritual complexes. Frederick Barth (1971: 184) pointed out long ago that Mountain Ok cults were a shared form with variations reflecting the history of Mountain Ok populations as they moved south and east. People were keenly aware of their common cultural heritage, especially the sharing of a pan-regional origin myth associated with the creatress Afek (Brumbaugh 1990: 54). On the other hand, as has been argued by Huber (1990), while there were consistencies in the ritual forms found in the USB and the Border Mountains, they could not be regarded as having belonged to any single tradition with a particular origin or as having been spread according to population movements. Rather, it seems that ritual elements had their own patterns of diffusion.

For much of the Border Mountains, and to some extent the lowlands, fieldworkers have described communities as possessing eclectic ritual portfolios with an array of rites, each of which had diverse applications and variable degrees of interdependence. In reference to the Waina, Gell (1975: 218) offered two major categories – 'fertility' or 'curative' – into which their rites could be positioned. All communities possessed curative or fertility rites but the degree of elaboration was governed by the capability and motivation of the community concerned. Large ritual performances often required months of preparation, accumulation of food and a

commensurate degree of community organization for the assignment of particular ritual tasks and obligations, while the smallest rite might involve a single individual uttering an incantation.

A complete inventory of a single community's rites would have been beyond any fieldworker considering the timeframes within which research was undertaken and the irregular nature of ritual performances. Nevertheless, a tentative 'corpus' has been provided by Huber (1990) for what he terms the Anggor 'symbolic system'. Large rites comprised elements belonging to three categories as affirmed by the emic nomenclature provided by his informants.

The category comprising the most fundamental elements, and most likely to have extraneous origins, was known as *sahwaf*, a term he interpreted as 'magic' or 'modes of action'. These included spells, charms or gestures enacted to encourage garden fertility, hunting success and other such practical concerns (Huber1990: 152-153). Huber points out that although *sahwaf* can be obtained from local spirits, these are also commonly sold between communities.

Huber (1990: 154) interpreted his second category *hoeli* as 'religion', 'poetry' or 'songs'. *Hoeli* provide themes and narrative elements that directly refer to the host of local spirits. These are the liturgical components that make up the Anggor mythic repertoire and differ from *sahwaf* in that they are 'public, intelligible and systematic'.

The final category includes the paraphernalia, props and choreography associated with the performative aspect of ritual (Huber 1990: 154). Known as *sambero* they correspond with what is referred to in Tok Pisin as *tumbuan* a common term for lower and middle Sepik masks and effigies that hold or convey the presence of spirits.

Huber's description of a major Anggor ritual known as the *sanindohoeli* serves to demonstrate how a body of *hoeli* are brought together to form a liturgical program that provides the basis for a large communal rite. For the *sanindohoeli* each clan provided painted sago-spathe plaques (*sir*) each with a motif representing the clan's

allied spirit. These are mounted on large effigies, drawn together and carried by the community in a procession through the settlement before being deposited in a temporary cult house (Huber 1990: 154).[72]

Huber (1990: 153) makes clear that the performative act and the paraphernalia are easily disarticulated and recombined according to ceremonial context. For example, he reports that *hoeli* attributable to certain spirits were recited in isolation and discusses three elaborate rituals comprising *hoeli* that adopt *sambero* utilised in the *sanindohoeli*. Huber positions these particular rituals both within what was earlier described as categories, including either fertility or curative rites, which may exist outside the major liturgical cycle of which the *sanindohoeli* is a part. Therefore, while they involve complex performative aspects and exist within the same 'symbolic system', each was independently constituted, or reconstituted, and actively directed towards specific imperatives.

The most evidence for a coherent sub-regional tradition within the Border Mountains is provided by Alfred Gell and Bernard Juillerat whose well-known publications provide structuralist and psychoanalytical interpretations of an epic ritual narrative shared by a number of villages that span the Border Family of languages (Gell 1975; 1992; Juillerat 1992b; 1996). In their appraisals both Gell and Juillerat provided similarly detailed and programmatic sketches. The authors argue that the figures embodied essential qualities of female fertility and male ontogenetic categories infused with symbolic reference to natural analogies. This narrative positions the cycle of natural fertility as that associated with the fecundity of sago and coconut, the totems of the moieties. As was convincingly demonstrated by both Gell and Juillerat, the ritual's narrative and drama reconcile cosmic order with the regeneration of society.

Specifically, masculine qualities are positioned in opposition to feminine while the societal model, in the form of ideal men, is positioned in opposition to natural chaos: males emerge from maternal control and pass through both ontogenetic and

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[72] Huber's descriptions of the procession reflect descriptions of rituals performed in [West] Papua by Yafi speaking communities (Hoogerbrugge 1995: 172). *Sir* and their effigy mounts also have a striking concordance with those involved in ceremonies practiced by Yuri-speaking societies to the southwest (Peter undated).

social categories as they mature, ultimately becoming elderly men who return to the natural state. Social order is reasserted through the maturation of boys into virulent men.

Each performance comprised equally elaborate and highly choreographed sequences of costumed figures, usually pairings of clan members belonging to each of the moieties (Gell 1975: 177). These were often accompanied or interspersed with sets of chants and music played through wooden trumpets and the appearance of lesser figures. The rituals also comprised a diverse range of gestures, body paintings, masks and costume elements, the most elaborate of which were an array of distinctive masks fashioned from a range of natural materials (Gell 1975: 174, 186). Usually these consisted of a cane or rattan framework and sheath which was often painted and/or included applied components such as leaves, fruits, flowers and feathers. Aside from the differences between the ethnographers' interpretations, taking into account minor differences between the two programs, a comparison of their format and performative aspects, including paraphernalia, demonstrate that there was no important difference either in complexity or content between the two forms. It is surprising then that members of the Amanab-speaking community of Iafar readily acknowledged that they had adopted the form wholesale from the Waina (Juillerat 1992b: 21).

For many communities throughout the southern part of the USB, near the course of the Sepik where communities were small and regional settlement patterns were relatively diffuse, such large cosmological cycles were not reported and less formal and irregularly performed *sing sings* or therapeutic rites took place (Craig 1980a: Part 1, 31: 19; Mitchell 1975). Nevertheless, some ritual modes, performative elements, and paraphernalia used for these rites appear to be of an analogous nature. Indeed, as I travelled from museum to museum collecting the data, I was struck by the similarities between paraphernalia, belonging to linguistically disparate communities of the hills and plains, such as masks, ceremonial plaques and the large gourd phallocrypts and bone belts used in dances, and also by the similarity in the way that these were assembled (Appendices 18a-d).

Clearly, as Huber (1974: 40) observed, difference in language and culture appeared to do little to prevent the dissemination of ritual elements and clearly whole programs commonly moved between the Border Mountains' communities. But even where differences were relatively great this did not prevent more discrete elements from diffusing:

> Anggor informants commonly contrast themselves with the Dawol [(Biaka)] in terms of their ecological and subsistence situations…..the Dawol are believed to posses knowledge of particularly efficacious and beneficial ceremonial forms….., several of them have been adopted [by the Anggor] and disseminated to the west,….. Curiously, the Anggor do not assimilate the Dawol ceremonies into their own spiritual or ritual categories, or attempt interpretation or exegesis of them (Huber 1974: 39).[73]

Huber's observation concerning the lack of interest in non-local exegeses is important. This appears to have done little to dampen the eagerness with which rites were borrowed, and conceivably made rituals and ritual components easier to assimilate. Indeed Huber (1990: 157) provides an example where an Anggor village sent apprentices to a distant community after seeing a performance by a neighbouring Anggor village. Their enthusiasm was not driven by any exegetical understanding of the ritual but rather that a 'tumbuan associated with it were extraordinarily tall and that this was a nice twist' and that the 'songs were pleasing'. Kelm and Kelm's (1980: 381) account of a newly adopted therapeutic ritual in the Yellow River area called *wowi* suggests such this attitude was commonplace:

> Unfortunately, in Abrau we were not able to interpret the words of the Wowi songs since the assistance of the guides was even less successful than in Kwieftim, particularly in view of the fact that the singers themselves barely understood a word of the songs they were singing…..knowledge of the Wowi cult has only recently been brought to Abrau via Maurom and Kwieftim, from the villages of the Upper Sepik, and since practically no one in Abrau speaks a dialect other than Auwon, it is understandable that the

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[73] Juillerat (undated), reports Kwomtari rites concerned with the supplication of forest spirits to fight sickness, being assimilated into local complexes, inclusive of associated paraphernalia, by both northern and southern Amanab groups

texts could not be translated (Kelm & Kelm 1980: 381-translated by K. and M. Fyfe).

Unlike other areas of the Sepik region, there seems to have been little systematic conveyance of ritual forms (c.f. Mead 1970: Roscoe 1989b; Smidt & Marepo Eoe 1999; Tuzin 1978). Although there was a strong predisposition to borrow ritual forms, unlike in the middle and lower Sepik areas, apart possibly from Umeda-Punda, there were no consolidated centres of cultural innovation. Elements came from multiple sources and were proliferated accordingly (Huber 1990: 157). Along with the volatile nature of social units and the usual trepidation concerning the metaphysical, this is probably a major reason for the considerable rate of redundancy that was also apparent for ritual forms (Huber 1990: 156; Juillerat 1992b: 21).

13.5 Ritual in CNG

While the patterning of USB ritual elements may be best explained according to variable processes of diffusion, substitution and loss, cult and ritual forms throughout CNG seem to belong to a core tradition that evolved into a number of sub-traditions with various degrees of ritual complexity (Barth 1987; Brumbaugh 1990).

Unlike rituals of the lowlands, Mountain Ok cults can be more satisfactorily explicated in terms of sociological function. It asserted community values through an emphasis on war and taro gardening, each imperative providing the basis for two opposing but complementary ritual divisions that positioned men within a structure of ritual obligation (Brumbaugh 1980a; 1980b; Jorgensen 1981; Wheatcroft 1975). Cult activities also asserted social order through a system of initiation grades and strict gender separation permanently and physically manifest in the architecture and plan of the village (Appendices 9d, 18e-f; Craig 1969b; but see Morren 1986: 223).

But beyond this common heritage, integration across the region is limited to communities linked according to the cognatic descent unit membership discussed earlier. Barth (1971: 182) and Hyndman and Morren (1990: 10) have described CNG as a 'sphere' constantly being reconfigured by centre-periphery demographic

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movement. As far as diffusion of ritual forms and components was concerned, the process was probably far less dynamic than in the USB and, as Barth (1987: 36, 53) points out, less easy to facilitate due to the emphasis on exegesis and the incompatibility of exegetical constructs in line with social differences between groups.

The internal and localised modes of transmission had a far greater role in the 'variable balance of loss and accretion' that shaped the content of cult and ritual complexes, especially the focus on secrecy, reliance on inter-generational transmission, and the tendency to preserve ritual knowledge in the safekeeping of a small select group of elders (Barth 1987: 27-29). It was these internal processes that led to the emergence of a set of sub-traditions, with marked exegetical differences accompanied by a series of social changes that reflected changes to subsistence strategies as populations increasingly spilt from the core of the system out through the differing environments of the central ranges (Barth 1971; 1975: 260; 1987: 16; Gardner 1983).[74]

Nevertheless, throughout the Mountain Ok region, fieldworkers observed a propensity for men from regionally peripheral communities to participate in rituals in other parishes closer to the centre, supplicate important men in ritually proficient groups, and adopt 'new cult varieties' (Barth 1987: 54; Craig 1969b: 71-2; Eggertsson 2003: 30). Importantly, Telefolip provided a regional cult centre that drew people from other language groups and from which some innovations spread to the fringe (Barth 1971: 183).

Interestingly, the Mianmin system to some degree represents the fusion of highland and lowland complexes (Morren 1986: 203-235). Mianmin ritual was of two kinds:
- those performed to mark transitions in settlement patterns and fluctuations in environmental fecundity; often these would involve the construction of a cult house and accommodate any of the four initiation rites practised by the Mianmin (Morren 1986: 222-235).

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[74] Barth (1971: 183) makes reference to the diminution of cult complexity, such as the reduction in initiation grades and number of cult houses, as populations moved south and east into the rugged environment of Central New Guinea's southern slopes

- those activated in response to setbacks to the ecological or social framework, most especially an occurrence of illness within the community; this included small rites performed privately.

One 'festival' that marked the re-aggregation of a Mianmin parish community into a longhouse, the *natim*, appears to have merged elements from both highland and lowland rituals, as well as a type of dance house used by lowland groups (Craig 1980: Part 1, 11-12; Guddemi 1992b: 182ff and Fig. 4, p.192) but unknown to other Mountain Ok populations. During the nights of dancing, men wore 'grossly exaggerated' gourd phallocrypts (Morren 1986: 227), commonly worn in various forms for sickness rites throughout the USB but not worn elsewhere in CNG.

13.6 Discussion

For much of study area, ritual forms were widely disseminated, arguably more extensively than artefacts. While the extent of the social networks among the communities belonging to the different languages of the study area may be difficult to determine, it resulted in therapeutic rites, regenerative fertility rituals and male cults with common structures, themes and paraphernalia. For the USB, and to some degree the Border Mountains, the components that made up each community's ritual complex included elements with very different histories. In CNG, both the sharing of cognate forms and diffusion from the core to the periphery maintained similarity among the Ok groups, although isolation and local processes of drift undermined this homogeneity to some extent.

While there may be important differences in the way ritual assemblages were shaped in the study area, what is more important is that it was the men who 'owned' these rites, who practised and participated in them. Ritual not only brought nearby communities together, but provided another important incentive for men to look beyond their immediate neighbours and engage with men in more remote communities.

14. Warfare

Throughout New Guinea, conflict was also a primary factor in the aggregation of social units into larger communities and a rationale for the extension of ties beyond the community (Roscoe 1996). Warfare in the New Guinea highlands, for example, often gave rise to loose confederations of neighbouring communities. The degree of amity was more or less determined by the strength of existing social relationships, especially filiative ties between the communities.

This was true for CNG where there were relatively large populations in the broad intermontane valleys, resulting in population pressure and a tendency towards territorial expansion. The Telefolmin, in particular, exhibited a considerable capacity to activate a range of social ties, and war parties could include a large number of villages from several parishes (Brumbaugh 1980b: 149). Suspicion and animosity towards outsiders reflected a history of aggression and grievances over disputed territory.

Conflict between groups on the highland-lowland fringe, however, has been described as sporadic, opportunistic, and favouring the higher altitude groups:

> …..predatory warfare directed against May River peoples [by the Mianmin] was frequently…..motivated by the desire for human flesh, women and children, booty or sport (Morren undated: 47).

Conflict in the lowlands was a relatively localised affair and, as Morren (undated: 10) points out, may have been motivated by a concern for the 'maintenance of buffers' and 'denial of access to patchily distributed natural sago stands'. Nevertheless, the events leading to conflict were often linked to a suspicion of sorcery and the perception of non-reciprocation, especially in matters of marriage and access to hunting resources (Craig 2008). Alliances between small communities linked by affinal and matrilateral ties were spontaneously activated for pre-emptive raids or reprisals, and were reconfigured constantly due to the relatively unstable and transient nature of settlement and marriage patterns (Craig 1973: 7/3, 4).

Considering the circumstances and permutations associated with conflict it would be difficult to assess the impact that it had on the dissemination of cultural traits.

Besides, as far as the study area is concerned, by the time the majority of the collections were made, warfare had ceased for more than a decade.

Nevertheless, warfare would have had two essentially opposite effects on the socio-cultural picture:

- where animosity and conflict between groups were sustained over time it may have resulted in some reification of existing cultural differences and therefore constituted a relatively conservative mechanism in the areal patterning of culture;
- where communities were vanquished or unable to resist the threat of conflict, this often resulted in the dispersal of social units. Social units might then recombine with others that had different languages and culture. Indeed it is this process that led Hyndman (1979: 57) to describe the cultural picture of southern CNG as one involving a constant 'shifting' of group identity.

15. Conclusion to Section Four: the relative mobility of men and women

Taking into account the factors outlined in the previous chapters, it is likely that the patrimony of men and women followed relatively similar patterns of residency regardless of the rules of marriage. Essentially, women were exchanged between two exogamous units either within a communal unit comprising a single settlement or settlement cluster, or exogamous units belonging to two contiguous settlements or settlements groups. As these units had a strong bilateral emphasis with only a weak patrilineal bias, membership within such units was somewhat tenuous, and with any social instability, there was a tendency for these units to fission. Subsequent emigration, either in the form of individuals, family groups or kin group segments, was determined according to ties that had been established by marriage prior to fissioning. The migration of men retraced the paths of their mothers and wives.

After migration, subsequent generations of men were able to gain rights to land near the communities where they were born and sometimes new lineages were formed which in some contexts became an exogamous unit or part of a larger descent unit. These could be involved in exchanges with contiguous groups and because of the bilateral structure of society, after a few generations they too could wane or split and recombine, or be absorbed into another segment or group.

In terms of this history, it is unlikely there would be much difference in the way that culture belonging to men and women would have patterned. Rather than residency, it would have been the relative mobility of women and men that would have determined any difference in the way that each gender's culture was distributed through space.

It can be argued that men's mobility demonstrated a different spatial dynamic and range to that of women. As has been demonstrated by the sections on ritual and trade, there are numerous incentives for men to extend their social networks to groups outside their immediate affines. Importantly, male mobility starts early. Indeed the greatest amount of mobility between friendly communities is attributed to young men, or bachelors (Morren 1986: 242). In societies where brideprice is expected, many bachelors will start their trading apprenticeship largely due to the

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need to accumulate or ensure their own bridewealth (Brumbaugh 1980b: 42). At maturity, men are expected to demonstrate some facility for securing ties in other communities and a man's social worth is sometimes measured according to the number and value of these allegiances.[75] Ethnographies suggest that communities typically contained men of remarkable sociability who ended up having reciprocal partners in many villages and were instrumental in facilitating and preserving ties between more distant communities; in many cases there will be no marriage relations between these communities (Bercovitch 1989: 258; Brumbaugh 1980b: 41; Juillerat 1996: 225). Along with trade items men will convey ideas and knowledge across social boundaries that many members of these communities will rarely if ever cross.

Women's mobility, both before and after marriage, would seem to be entirely different. As Litteral (1978: 28) pointed out for the Anggor in the Border Mountains, women 'were not direct participants in the intertribal communicative network'. Indeed, Bercovitch observed that among the Atbalmin 'the majority of women have never travelled further than a day's walk from their local…..valley [while] the majority of men have travelled many times to areas at least four or five days' walk away'. Indeed their network of friends would have been much smaller and have extended rarely beyond close kin (Bercovitch 1989: 282). An endogamous woman would have very little reason to travel beyond her own village unless relations were bad with both her husband and consanguines thus convincing her to flee her village (Huber 1974: 178).

It is also important to point out that exogamous women often maintained a strong relationship with their natal village, most especially through the enduring and complementary relationship they held with their brothers (Juillerat 1996: 341). Indeed, many seemed to have returned to their natal village and even remarried there when their husband died or the marriage failed in their affinal community (Juillerat 1996: 295). Consequently, women's cultural forms and the ideas behind their conception are more likely to be restricted to smaller spheres of contiguous communities.

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[75] Although there were no 'Big Men' such as those men of considerable and far-ranging influence described for many New Guinea societies (Rappaport 1967: 29; Sillitoe 2001).

The following analyses attempt to determine whether this is indeed the case. However, there is one issue that we should be alert to and that is the possible effect of trade on the content of assemblages collected at each settlement. As the chapter on trade pointed out, both arrows and string bags were traded and often this trade would involve more distant communities. It is possible that trade items made up a significant portion of assemblages and were copied locally. If this is the case we would expect some homogeneity in the distribution for the two classes.

Section Five

16. Material Culture and the determination of socio-cultural relationships

16.1 Introduction

There has been some progress in determining the relative likelihood and ease with which particular linguistic elements and features are likely to be borrowed, change or be replaced by alternatives. As far as material culture is concerned there has been less progress in the establishment of general principles concerning which characteristics will more readily diffuse, change or remain relatively resilient in an atmosphere of social interaction. Indeed material culture has been considered a somewhat problematic variable because the distribution of artefacts and associated morphologies were seen as being most profoundly shaped by diffusionary processes, because artefacts could be traded between groups or copied and assimilated into other cultural assemblages (Barnett 1964).

Another thing that has stifled studies of material culture in anthropology has been the ascendency of functionalist, structuralist and ecological approaches in the discipline from the beginning of the twentieth century, which saw a decline in ethnological research and museum-based field collecting (Craig 2005c; Hodder et al. 2003). Interest turned increasingly to the study of social phenomena more likely to facilitate the identification of societal structures and systems that operate in and adjust to the environment. With these developments, interest in history and material culture waned; the interpretive role of material culture was largely residual or adjunct to that of social data (Heider 1969; Lemonnier 1996; Miller 1983; Sillitoe 1988: 5).

Nevertheless, for two crucial reasons the study of material culture has great potential for anthropological research. Firstly, as Childe (1956:1) pointed out long ago, artefacts are essentially 'concrete expressions' of a sum of cognitive processes and actions responsible for their conception and use and therefore provide unequivocal clues to particular intentions held by their makers. Secondly, they are able to be rigorously and repeatedly scrutinised for the extraction of a meaningful set of analytical units (e.g. Adams & Adams 1991).

For a large part of the twentieth century, this potential was almost exclusively utilised by archaeologists, although different problems and opportunities confronted

archaeologists when interpreting distributions of material culture (Schiffer 1994). Unlike anthropologists, who have the opportunity to observe a comprehensive range of social and cultural practices in the field, archaeologists are limited by two important factors concerning their research material: one, their samples are often sparse due to post-depositional processes; and two, they lack much contextual information on past societies and the environments in which they subsisted.

These deficiencies have restricted the evaluation of material culture phenomena in terms of their function and social significance as well as the processes responsible for their formal characteristics (Aldenderfer 1996). Consequently, there has been considerable controversy accompanying the interpretation of formal variation especially where it has involved ethno-historical evaluations of their distributions (Bordes 1973; Binford 1973; Binford 1984; Sackett 1986). This is not surprising considering 'cautionary tales' from anthropologists who have pointed out that significant differences in culture patterning can result from minor differences in ecological patterns or cultural processes that even in ethnographic cases can sometimes be almost imperceptible to scrutiny and thus lead to false assumptions (Heider 1967; Roscoe 1990).

16.2 Types and attributes: from tracking history to identifying process

Although anthropologists have access to a greater range of artefacts and associated contextual information they necessarily amount to synchronic data. Archaeologists, on the other hand, often have access to substantial chronological sequences of material remains that enable them to observe the patterning of material culture elements through time as well as space. In the late-nineteenth century a growing fascination with these patterns gave rise to what is known as the 'culture history' approach.

The culture history approach in Europe was motivated by a number of contemporary issues. Firstly, accumulated archaeological remains uncovered throughout the 18th and 19th centuries needed to be reconciled with putative ethno-historical groupings described or recounted in early historical accounts (for a discussion see Jones 1997: 15-21 and Shennan 1989). Secondly, the political and ideological currents associated with the growing nationalism of nineteenth century

Europe meant that some cultural historians became engaged with identifying quasi-historical progenitors of contemporary ethnic groupings which had been increasingly objectified with nationalist aspirations (Trigger 1978: 81-83). The culture historical framework therefore sought remains which could be identified with these ancient cultural groupings. They were able to access a considerable variety of remains found preserved in tombs, including ceramics and objects associated with metal-based technologies, to create diagnostic assemblages whose distribution could be used to postulate the homelands and diasporas of ancient peoples (e.g. Childe 1926; Childe 1929).

In America the lack of these kinds of historical and political prerogatives meant that initial interest in material culture involved sorting American ethnographic and prehistoric material according to contemporary evolutionary paradigms. However, this was soon overtaken by a desire to account for the cultural diversity apparent in ethnographic and prehistoric material across the North American continent (O'Brien & Lyman 2000b: 78-80). Archaeological collections were therefore seen as needing to be reconciled with this ethnographic picture as well as providing a chronological framework with which to sort the prehistoric record (O'Brien & Lyman 2000b: 88).

Unlike Europe, archaeology in America throughout the first half of the twentieth century relied almost entirely on ceramic remains. Throughout America, ceramic shards were sorted into types and the frequency of such types was tracked both diachronically and spatially. In terms of time, their frequencies often demonstrated unimodal patterns and therefore were correctly assumed to be stylistic. Consequently they were used not only to establish chronologies but also to determine cultural phases, divisions and branches in the American archaeological record (O'Brien & Lyman 2000b: 91-103).

Nevertheless, while their temporal and spatial distributions demonstrated non-random patterns, types were derived from phenetic assessments. To some degree the selection of characters was somewhat arbitrary and unweighted and lead to inconsistency in emphasis given to particular attributes whether they were formal, material or technical (Colton 1943; Krieger 1944). Aside from obvious questions as to whether types had any emic significance, the creation of types inevitably led to

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some conflation of formal differences that existed between their members and to neglect of attribute relationships that existed between members of different types (Adams & Adams 1991: 195-196).

It became increasingly clear that types were composed of attributes that varied in their historical, social and functional significance (McKern 1939: 306). Over time, analytical methods were increasingly used to identify attributes according to their material properties. Attributes were weighted according to a hierachy where 'certain visual or tactile characteristics' could be used to determine particular categories within types that had more discrete levels of spatial or temporal significance (Wheat et al. 1958: 34). One well known example was the 'Type-Variety' method. According to such methods, if the determinant of a 'type' was a particular formal attribute or design technique found within a sample of ceramic remains, a 'ware' could account for more fundamental properties in technology such as ceramic pastes or firing methods and would more likely have a broader distribution, reflect similarities in ecological conditions and subsistence patterns. On the other hand a 'variety' may be derived from decorative or formal affinities observed in increasingly discrete spatio-temporal contexts in which a 'type' or 'ware' occurred and therefore reflect a closer cultural relationship (Gifford 1960; Sabloff & Smith 1969). Nevertheless, such systems remained too selective and inconsistent in their criteria for determining attribute classes significant for such categories and compounded problems concerning the tracking of attributes across such divisions (Dunnell 1971; Smith 1979).

Over the years there have also been attempts to construct types on a more inductive basis to provide greater scope for providing both more reliable analytical units and ones that are more likely to reflect emic typologies but such methods have only lead to increasing levels of exclusivity and provided little avenue for assessing relationships between types.[76]

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[76] Those most cited include Spaulding's (1953) use of chi-square (x^2) to determine non-random co-occurrences of attributes. Other methods have involved hierarchical 'tree-type' binary subdivisions of attributes. At each level a sample is divided in terms of the most weighted attributes and each sub-division maximises inter-group difference while reducing intra-group variance, again using x^2 to determine the significance of associations (e.g. Whallon 1972: 24). One important non-statistical approach for the creation of types has been the analytic classification first elucidated by Rouse (1960). Types are naturally constructed by identifying and notating formal properties according to a

The emergence of a 'New' archaeology in the 1960s led to a significant reaction against the tracking of time and the determination of cultural divisions in the archaeological record. Rather than focussing on the patterning of univariate phenomena such as types it was argued that systematics needed to involve the partitioning of 'observational fields' to 'emphasize the nature of variability in artefact populations and facilitate the isolation of causally relevant factors' (Binford 1965: 205). This meant that functional classes became increasingly relevant to the discipline and formal properties, instead of being used as *significata* for defining types, were increasingly used in identifying particular functional objectives or formation processes (Schiffer 1972). Not surprisingly, the material record was increasingly approached as a synchronic and spatial phenomenon, one comparable to ethnographic analogues (Binford 1962).

In the 'systems' archaeology that came to the fore in the following decades, ceramics remained particularly important, not only due to their ubiquitousness and the fact that they were composed of a spectrum of formal and decorative attributes that could be easily articulated and notated for systemisation, but because these attributes were potentially diagnostic of a broad range of external factors impacting on past populations (e.g. Nelson 1985). Research into ceramics throughout this time was informed by an increasing use of ethnographic examples where processes responsible for ceramic morphology could be investigated firsthand. Firing methods, ceramic pastes, tempers, and construction techniques have been bridged to a set of discrete but inter-related technical and performance concerns (e.g. Arnold 1985). Formal properties have therefore not only been better explicated according to a range of functional and technical variables but there has also been increasingly sophisticated ways of determining socio-cultural factors impacting on the artisan's choice (Chilton 1998; MacEachern 1998; Stark 1991).

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prescribed hierarchy of technical attributes increasingly focussed on formal properties. These can be used beyond the confines of type for a range of interpretive and comparative purposes (Rouse 1960: 314).

16.3 Material culture and social units

From the 1960s another way in which archaeologists sought to determine the manner in which past populations adapted and responded to environmental change was to track change in the social composition and structure of ancient populations (Longacre 1966: 94). Material culture was seen as an excellent tool for such research objectives. James N. Hill, for example, in a paper discussing a prehistoric site in eastern Arizona, pointed out how artefacts could be used to identify social categories on three phenomenological levels:

1. 'Some items or stylistic elements have functional meanings (i.e., they are associated with certain economic, sociological, or religious activities'

2. functional classes 'may reflect the composition of *social segments*' (e.g., specific classes of items are used by men or women, hunters or priests, etc);

3. 'within any given class of items there may be stylistic differences associated with these various social segments' (Hill 1966: 10; emphasis in original)

Accompanying this growing interest in social patterns was an increasing focus on the ways in which enculturation and social interaction shaped distributions of material culture attributes in both intra-site and inter-site contexts (e.g. Deetz 1968; Whallon 1968). It was seen that if these processes were more comprehensively understood, the material record should reveal past patterns of kinship, residency and social structure (e.g. Braun 1985; Graves et al. 1982). One of the most important features of such approaches was the identification of normative values: the patterned occurrence of a particular attribute or range of attributes within the archaeological record suggesting an 'orderly transmission' of cultural behaviour (Deetz 1968: 43). Thus 'passive' processes in cultural patterning, such as those responsible for particular tendencies in artefact facture, became elucidated and formulated in what became known as 'learning-interaction' theory and used to explain synchronic patterning that corresponded with discrete levels of social relationship (e.g. Whallon 1968: 223; see Hegmon 1992 and Plog 1983 for discussion).

The other theoretical approach, concerning the way in which material culture may be shaped according to social patterns, has involved the exploration of the ways in which artefacts are able to convey messages between members of different social classes and units (Plog 1983: 127; see Dietler & Herbich 1998 for a review). Ethnographic studies concerned with such research objectives have intentionally focussed on a particular range of material culture attributes, especially those that are elaborate, visible and appear to be more significant in important social activities. The most sophisticated have sought to track the behaviour of a range of artefact classes across various social and spatial contexts. For example, the ethno-archaeologist Ian Hodder, after studying objects in a range of social milieus near boundaries between groups engaged in territorial and resource competition in western Kenya, concluded that differences between the groups' material culture could only be understood if it was seen as a 'language' (Hodder 1979: 447). Hodder believed that not only highly visible attributes such as body ornament were active in messaging but also a diverse range of utilitarian items such as hearths and domestic objects were seen as emphasising commonality and therefore asserting intra-community solidarity and cohesion (Hodder 1982: 37-57). Nevertheless what is clear from such studies is that artefact classes and attributes often provide polythetic distributions and pattern irregularly with other cultural variables.

One well known example, that of Pauline Wiessner's (1983) study of stylistic tendencies in San Kalahari bushmen arrows, has often been used to illustrate the relationship between these active and passive processes. Wiessner asked informants to distinguish between formal attributes of arrows belonging to their group and other groups. She found that even slight formal difference was recognised and that formal traits appeared to have different levels of social significance for her informants. For example, the size of an arrow point was something her San informants associated with larger group identity such as language, while shape was most likely to be identified with individuals (Wiessner 1983: 270). The first tendency Wiessner termed 'emblematic style', which she argued was used to recognise membership and difference between groups. The second tendency she called 'assertive style', which according to Wiessner (1983: 271) 'carries information supporting individual identity' and may have the role of positioning oneself within the immediate social context.

Nevertheless, the crucial issue concerning the examples that Wiessner uses for both 'emblematic style' and 'assertive style' is how they have become socially significant in these different ways. For example, it is likely that the size of the arrow was important to the functioning of the arrow technology used by that particular language group. On the other hand the shape of the arrow point may have been relatively unimportant to that particular technology and therefore was neither constrained by the object's function nor group biases allowing individual proclivities to have a greater impact on formal variation (Sackett 1985).

That which gives rise to a transition from a passive to an active direction in style is an individual or group imperative to differentiate from others and to establish social position through comparison (Wiessner 1989). The attributes used in such a manner may be chosen from any number of morphological characteristics that significantly deviate from those which one would usually associate with the functional class to which it belongs (Sackett 1985: 154; Plog 1990: 62). This is the basis for which certain particular variations in form become recognised, acknowledged and come to have cultural implications. What is most important about Wiessner's example for this exercise is that rather than having merely a particular cultural significance, an object or type may include a number of properties that are associated by people with different levels of social membership and identity.

17. Material culture: technological structures and learning regimes

17.1 Introduction

From the 1960s, archaeologists increasingly focussed on ecological and socio-economic variables, and the focus on material culture shifted from that of creating types, explicitly to be used to determine chronologies and culture-historical relationships, to one involving the identification of functional classes and the processes responsible for their material and physical properties. This ultimately led to a greater recognition of the variable ways in which material culture attributes behaved in particular social milieus and patterned according to social distance. To recapitulate, some formal similarities reflect shared propensities to furbish or decorate artefacts in a particular way while others may become active in expressing social identities and reinforcing the awareness of social boundaries.

17.2 Technology

Over the last two decades there has been a growing interest in reconciling and moving beyond a focus on either of these tendencies. Instead, ethno-archaeologists have increasingly shown interest in how technology structures social activity and how a set of technological choices become directed by social history, or *habitus*, and other culturally directed behaviour (Dobres & Hoffman 1994; Lechtman 1977; Lechtman and Steinberg 1979; Stark 1998b). In two important senses 'style' can be seen as a product of technology:

- the technical choices and the production process that result in an artefact both order social activities and are ordered by socio-cultural conventions; and
- technological know-how ultimately determines a large part of an artefact's formal properties.

Technology has been assessed in terms of broad-ranging craft milieus and ethnographic studies have attempted to link the various activities and behaviours associated with procurement, processing, production and use of artefacts (Lemonnier 1992; 1993a; 1993b; Miller 2007: 193; Dietler & Herbich 1998: 253; Wallaert-Pêtre 2001: 471). These have often been demonstrated to be part of integrated systems producing operational chains (*chaîne opératoires*) that become

innate to a group of craft people. For example, Wallaert-Pêtre, after undertaking field studies with potters from small-scale agriculturalist communities in Cameroon, determined that

> …..potters in all groups possess specific knowledge and develop a specialized vocabulary….. They reproduce behaviors as they have been taught and are not concerned with the theoretical concepts behind their actions. Thus, the apprenticeship relies not only on the conscious use of specific knowledge of every step of the chaîne opératoire *(*the vocabulary) but also on the unconscious use of meta-connaissances acquired by repeated practice, what we might call 'family recipes' (Wallaert-Pêtre 2001: 482).

Gosselain (1992: 572), who also undertook ethnographic studies amongst a community of potters in Cameroon, observed a similar tendency for individuals to internalize a set of integrated group modes and concluded that these were often so entrenched that any alternative would seem to be inconceivable to those that shared them. Also, as Sillitoe (1988: 13, 18-19) found for the Wola people of the Southern Highlands of New Guinea, certain procedures not only become preferred by the Wola community but there is a degree of interdependence between the techniques they use. Consequently, the integrative character of technological knowledge necessarily leads to significant differences between groups and even where interaction between social units is present, existing technological configurations can constrain the transference of components between them (Lemonnier 1992: 52-54).

Also the formal properties of any artefact or assemblage will reflect such technical differences and become visibly apparent (Lemonnier 1992: 62, 80). As made clear by Wiessner's example awareness of these technical differences may be apparent to those of other craft traditions and observed in particular formal features (Dietler & Herbich 1989: 154). These differences even may become culturally important to members of a particular tradition. For example, MacKenzie (1991: 136) reported that Telefolmin women were very conscious of technical differences between their string bags and those belonging to women from other groups, and in recent times they had chosen to develop techniques that accentuated these differences, so that they could intentionally signal their identity to members of other social groups.

17.3 Technology, learning modes and interaction

Another important consideration for a technological approach is that particular craft practices and technical procedures require particular modes of learning. The mastering of technical skills needed for such things as pots, textiles and tools requires a considerable period of intense instruction. This is undertaken at a particular developmental stage in the learner's cognitive and physical development (Arnold 1985: 206). As far as most crafts are concerned, training is most effective when social distance between the teacher and student is minimal and when the learner is at or near an optimal learning age, which is usually before or during early adolescence (Shennan & Steele 1999: 369). What also has been demonstrated is the importance of an interface between the cognitive and motor capabilities of children at various stages of their development. Maynard and Greenfield (2003: 490), for example, found in their study of Zinacantec Maya weavers in Chiapas, Mexico, that skills associated with a portfolio of weaving tools were progressively introduced to girls and 'had implicit stages of cognitive development embedded in them'. They concluded that '[c]ultural-general Piagetian stages are harnessed in cultural-specific situations' (ibid.: 489). Likewise, MacKenzie (1991: 100-101) found that elements of string bag technology were mastered throughout maturation and that girls were constantly given opportunities to absorb and learn skills within the familial and social sphere:

> All young Telefol children…..will begin to help their mothers and elder sisters by shredding the raw fibres in preparation for roving and spinning string. From the age of about two onwards children begin to experiment with roving, rolling the shredding fibres down their thigh to make a single ply, and progress to experiments with spinning …..[B]asic looping technology is absorbed steadily from the time a daughter first sits in her mother's lap and is able to observe her mother's hands constantly working…..[O]bservation is followed by internalization and then mimesis….. [As the girl develops], technical competence is achieved haptically, by touch, as a motor action rather than as an intellectual activity.

These examples suggest that children in traditional societies are on the whole taught or exposed to skills considered appropriate to their developmental stages to maximize competency and ensure that complex and difficult skills are mastered by

the end of childhood. It is not surprising that ethnographic studies undertaken among traditional potters, basket makers and other craftspeople have shown that the process of mastering many prefabrication and fabrication methods, requiring complex cognitive and motor skills, are learnt during childhood apprenticeships, and that individuals are in large part taught by their older siblings, parents or grandparents (e.g. Gosselain 1992: 563; 1998: 94-95; Pryor & Carr 1995: 293). We would therefore expect these skills to be enduring and difficult to replace as individuals develop their own personal styles, even where they are exposed to alternative craft repertoires.

Studies have shown that procedures involving complex motor skills often result in particular characteristics that are fundamental to an artefact's form. Arnold (1989: 182), for example, found during a study of potters in Ticul, Mexico, that the body shape of ceramic vessels corresponded closely with kin relationships within the community, primarily because the technique appropriate for shaping vessels required a characteristic set of motor patterns. Likewise, Pryor and Carr (1995: 276), in their study of ethnic basket making in northern California, found that baskets made by mother and daughter demonstrated greatest formal affinity and that this could be explained by the mutual use of 'fundamental' motor procedures. Just as Sillitoe had found, Pryor and Carr (1995: 267) discovered that some of these fundamental steps, often used early in a production sequence, determined what was used later in the production sequence, and therefore placed limitations on what could be borrowed from other traditions.

Clearly, then, many craft technologies have the potential to reflect group histories and genealogical relationships. The question remains as to the manner in which the mechanisms of social integration and interaction disrupt this relationship. For one thing traditional crafts are usually gender specific. Many that are the focus of ethnographic studies, such as ceramics, basketry and textile crafts, are exclusively practised by women (e.g. Wallaert-Pêtre 2001: 476). Because many traditional societies are involved in marriage exchanges with other communities, even with groups who speak other languages and possess different cultural forms, the manner in which residency and marriage systems determine the movement of personnel

between communities will influence how craft traditions learnt in childhood or adolescence are likely to spread between them (e.g. O'Hear 1986).

Many traditional societies, including those in New Guinea, are patrilocal and women often marry out. This should, conceivably, lead to greater homogeneity of women's craft traditions across the communities that share marriage relationships. But under such circumstances, it is also important to consider the age at which women marry and what skills can be modified in early adulthood (MacEachern 1998: 114).

Sometimes it is traditional for pubescent girls to marry and be exchanged between communities before they have fully learnt the crafts of their natal community. They then may be taught local craft skills by their affines (MacKenzie 1991: 104). At other times, women in early adulthood marry out and adopt particular techniques via intense instruction from their affines. The question is, to what degree does this make an individual's repertoire compatible with the local technological milieu (Gosselain 1998: 102; Herbich 1987; MacEachern 1998: 123). In either case, some techniques learnt in their natal villages would remain impervious to extrinsic elements and, eventually, there would be homogenisation across communities.

At this point it is appropriate to note the differences between the learning regimes and skills associated with particular crafts within a society. These may lead to differences in the way attributes belonging to each distribute according to the social relationships that exist within and between communities and therefore the way in which they distribute over space. For example, while MacKenzie observed that Telefolmin girls usually began their apprenticeships at a very early age, until the first stage of initiation at around seven or eight years of age, boys remained in the keep and company of their mothers and even learned to spin string (MacKenzie 1991: 100). Thus boys were not usually taught male craft skills, such as those associated with arrow production, until their teenage years when they were more regularly in the company of adult males and as they were becoming more socially mobile (Barry Craig, pers. comm. 2007). Many of the skills associated with making such things as arrows are therefore more likely to be easier to master at a later age

than those associated with string bags and be more transferable in broader social contexts.

Aside from craft techniques and procedures that require relatively intensive modes of learning, there will be those that are less complex and less fundamental to the overall manufacturing process. It is these elements that are arguably more pervious to introduction and innovation and have the potential to be readily transmitted via less formal social relationships. Cultural variants within this range can be more easily adopted by mature individuals who have greater mobility and are interacting with wider networks of people (Boyd & Richerson 1985: 8).

Attributes of objects that are commonly traded may also be more likely to diffuse because such objects can be more intensely scrutinised by a greater number of individuals foreign to the social group that made them (Pétrequin & Pétrequin 1999). Nevertheless, there will still be variability in the degree to which these attributes can diffuse. For example, Craig (1976) was able to observe firsthand an intriguing example where Abau (upper Sepik) men attempted to assimilate attributes from a Keram (lower Sepik) shield design introduced by a man from that lower Sepik area. He concluded that although local artisans were eager to copy the shield's design, particular features, such as motifs, were readily appropriated, but the design's structure was subverted by local conventions and the Abau men made only a cursory attempt to copy the distinctive effect created by the carving technique (Craig 1976: 190-3).

Craig's observations are consistent with those made in ceramic studies where social distance is reflected in particular characteristics of a decorative regime. Studies have shown, for example, that design elements or motifs diffuse fairly easily in both inter-group and intra-group contexts, while the structure, program or 'design grammar' – and often the techniques that people use to create the designs, such as incising, painting or use of relief – diffuse less easily and were better indicators of closer social ties between artisans (DeBoar 1990; Friedrich 1970). Conversely, where design structures and techniques are similar, it has been shown that design elements diffuse more readily between traditions (Roe 1995: 50).

One of the most compelling approaches has focussed on symmetrical tendencies apparent in design patterns. Washburn (1989), for example, offered a selection of computer generated symmetrical designs, and arbitrarily chosen motifs and design elements lacking all reference to traditional textures and colours, to female weavers from villages in Laos and Zaire. She found that their preferences were invariably aligned with symmetries common to textiles from their respective traditions.

Symmetrical structures have also proven useful in archaeological examples as a means of notating decoration across a diverse range of ceramic forms. Washburn and Matson (1985: 81), for example, found that structural aspects of design strongly reflect long-lasting traditions and regional social relationships. Their use of multi-dimensional scaling to determine clustering of symmetrical tendencies within Southwest American ceramic design revealed a clinal spatial pattern that corresponded with the widespread exchange networks that had already been inferred from other archaeological data.

17.4 Discussion

Technological repertoires apparent within a material culture dataset can be used to explore historical relationships, as they provide a way of articulating units that are sensitive to different levels of social relationship. This is because technological choices are variably regulated by social predispositions and the social context of production, the learning modes required for an individual to master them, and their compatibility with other components in the technological structure (Lemonnier 1986: 160). Nevertheless, for a technological approach to provide meaningful values with which to represent cultural choices, technical choices must also be identified in the context of their mechanical and operational significance to provide a better understanding of the constraints and to ensure that functionally different attributes are not used in cultural comparisons without justification. The following chapter will attempt to demonstrate how this may be accomplished.

18. Employing a techno-functional approach to construct a framework of classification

In Chapters 15 and 16, I provided a brief overview concerning the ways in which archaeologists used material culture to create analytical units to identify socio-historical relationships. In doing so I have attempted to demonstrate that a fully operational systematics requires analytical units that are not only in themselves theoretically derived, but are also conditionally positioned so that they provide relative values. The previous chapter went on to suggest that an appraisal that focuses on technology should provide a more rigorous means of doing this. The key then is to establish how technology can provide such a methodological framework.

There are systems that have attempted to do this. One that I considered most useful was Carr's (1995a; 1995b) 'unified theory of artefact design'. The approach intentionally uses technology to provide 'skeletal frameworks' that enable formal attributes to be positioned and compared in a relative manner. The most compelling feature of Carr's approach is that it entails the ordering of components (attributes) according to a complementary set of hierarchies respectively reflecting either a sequence of design decisions, production steps or the relative visibility of each of the artefact's attributes (1995b: 247-248, see also Miller 2007: 29). The first two help to map 'the relationship between form and process' by determining an order of functional and technological considerations whereby each step in the sequence of decisions cumulatively constrains successive decisions or steps (Carr 1995a: 160). The relative visibility or comprehensibility of a component, on the other hand, determines the ease with which that component is able to be observed and comprehended and therefore has a direct impact on the likelihood that an attribute will be copied by those at a greater social distance. Carr's work enables a simultaneous investigation of both passive and active tendencies of style by drawing attention to the fact that as particular traits are more likely to be associated with particular modes of learning there will be considerable variability in how traits can be consciously modified by the individual. It also provides a means of inferring the degree to which attributes are shaped and constrained by function, and therefore enables a better determination of the band of flexibility within which individual behaviours and discrete social processes impact on their form.

Pryor and Carr (1995) applied the model to a basketry tradition of northern California by establishing hierarchies determined by sequences of design decisions, manufacturing steps and attribute visibility. As expected, choices early in the sequence constrained the bandwidth of available choices later in the sequence. For example, Pryor and Carr (1995: 268) found that basket form and weave impacted on the types of decorative elements and patterns that could be used, and secondly, they found that the relative visibility of attributes increased progressively along the sequence of manufacturing steps and was also somewhat reflected in the sequence of design decisions (Pryor & Carr 1995: 267).

Although such a framework provides an excellent means of tracking and explaining particular distributions in social space, such a regime is not fully applicable to the present sample. Apart from some of the string bags, the sample is provided with minimal and inconsistent information concerning the materials, techniques and production sequences associated with facture. What some of the accompanying notes, other related information and basic practical sense did enable was the determination of discrete functional classes and subclasses with particular mechanical and operational properties. These provide parameters with which to derive further information from a sample. In this regard it was deemed necessary to take a more explicitly functional approach than Carr's with the provision that formal attributes must be first assessed according to their operational significance and their mechanical interrelationships as this provides the framework with which to position values determined from the scrutiny of formal properties (Hurt et al. 2001; Neff & Larson 2003: 248).

For example, we can see that a human face provides a system with a relatively clear order of structural and functional importance according to which attributes are relatively easily positioned. For example: a nostril is first a feature that functionally and structurally is attributed to the nose and a nose is essentially a primary feature of a face. These features are always conceived of in this manner so if one was to establish a scale of importance for these facial features it would start with the face and end with the nostril. If we were then to add the eyes to the order we would soon see that it would assume a similar position of importance to the nose in that they have an equal position in the functional order but remains structurally and

functionally independent from the nose. The existence of a nostril is contingent on the nose but the eyes are not and neither is the nose's existence contingent on the existence of the eyes. The existence of the face is contingent on neither of these features but it determines what type of features we would *expect* to find. This is also the case for these major facial features because they are each composed of a number of lesser features that can be positioned within the order (Hurt et al. 2001: 54-56). For example, without a nose we know that the existence of a nostril is unlikely. Through our understanding of structure we understand what it is that we are comparing and this is generally what we can do with such a sample. Therefore if our sample included two faces and one of them does not have a nose we know that they are somewhat structurally and operationally different and that a comparison based on the morphology of both nose and nostril is not possible, while a functional comparison based on the presence or absence of a nose is. Such a system follows to some extent what archaeologists call paradigmatic classification, in that there is a set of functionally invariant attribute levels that offer the classifier a set of attribute dimensions with a set of values to assign to each specimen (Banning 2000: 39; Cochrane 2001; O'Brien & Lyman 2000a: 82-86). But, unlike paradigmatic classification, each attribute level is conditionally positioned and weighted to ensure that values can be determined according to the mechanical context within which the attribute is observed.

How can we be sure that we have satisfactorily positioned attribute levels? For one thing, cultural assemblages may have holarchical structures such as those found for the human face, but attributes belonging to functional artefacts in general are more hierarchically weighted in structure because the fully integrated wholes are generally more directed towards very specific outcomes and perform in very specific operational manners.

The first step is to use this notion to weight the hierarchy of components; the more directly a component is impinged by the primary function of the whole the more it will impinge, rather than being impinged by, the values of other components. These relationships may not be identified and reconciled if the mechanical relationship between components is not properly understood. In this regard Hurt et al. (2001: 55) draw attention to an example where variations in arrowhead size result in different

ratios in shaft length and thickness. Of course we can argue the reverse for particular examples, but unless we can successfully demonstrate this, the former must be taken as granted because the size of the arrowhead is more crucial to the arrow's function. The value of a mechanical consideration and ordering is also somewhat reflected by its similarity to evolutionary theory concerning hierarchical sorting of biological traits whereby the fitness of one crucial phenotypic character will determine the selection for an associated trait, while the opposite may not be true; this would conceivably determine an order of functionality in terms of evolutionary fitness and explain absences of particular attribute levels or states (Hurt et al. 2001: 57).

In the context of investigating processes responsible for artefact change and variability, Schiffer and Skibo (1987; 1997) have provided some useful ideas with which to consider such weights and contingencies. They suggest that the first step is the creation of a 'performance matrix', a 'list of the performance characteristics thought to be relevant to all activities of each artefact's life history' (Schiffer & Skibo 1987: 601). By focussing on performance, the design process and the mechanical relationships between an artefact's components, each component can be weighted according to the primacy of its position within the matrix. Schiffer and Skibo (1997: 39) suggest that such weightings will demonstrate threshold values that 'must be reliably reached in order to permit or cue any interaction during downstream activities', and also that these to some degree dictate an order with which the artisan must resolve performance issues associated with the functioning whole. We can see from the following diagram (Fig. 18.1) that this path of consideration potentially provides both nested and bounded attribute parameters with which to account for and accommodate an artefact's formal characteristics.

Fig. 18.1 Diagram of consideration path for an artefact's components and mechanical properties.
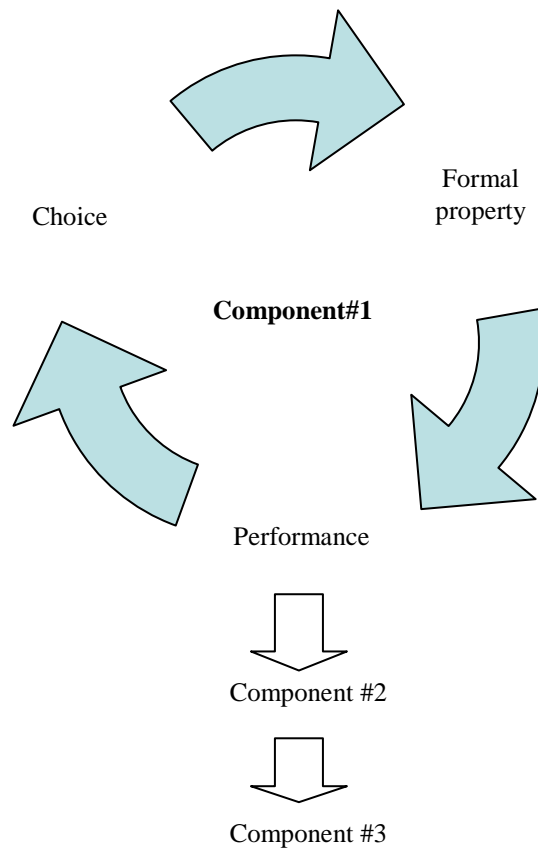
Schiffer (1975) originally coined the term 'correlate' for the sum of principles used to identify and explain feedback between performance and choice and their impact on an artifact's formal properties. These principles can be used not only to identify and explicate an artifact's physical properties but also, extensionally, to determine more discrete patterns of cultural behaviour. For Schiffer (1975: 838), such correlates embody the 'relationships between behavioral and organizational variables of a sociocultural system and variables relating to the material culture and environment of that system'. As technological and material choices have 'tangible effects on an artifact's formal properties', the formal properties of each component potentially provide a means not only to determine a value or sum that reflects the constraints determined by its performance objectives, but also discrete patterns of cultural behaviour and procedure and processes that gave shape to the component within the threshold or dimension at which an acceptable performance value is reached (Schiffer & Skibo 1997: 31; see also Van Pool 2001). Following from this

we can see that such a method has the potential to enable an object to be conceived as a series of 'correlates' that must necessarily be positioned according to their functional primacy and their mechanical and technical interdependency. In this regard values at each attribute level may be used to infer and conceptualise where, why and in what manner cultural processes have impacted on the formal properties of an object and if and to what degree formal properties may be employed in active cultural processes (Fig. 18.2).

Fig. 18.2 Diagram of consideration path for an artefact's components and mechanical properties factoring in cultural processes.

Passive cultural process

Active cultural processes

Choice

Formal property

Attribute#1

Performance

Attribute#2

Attribute#3
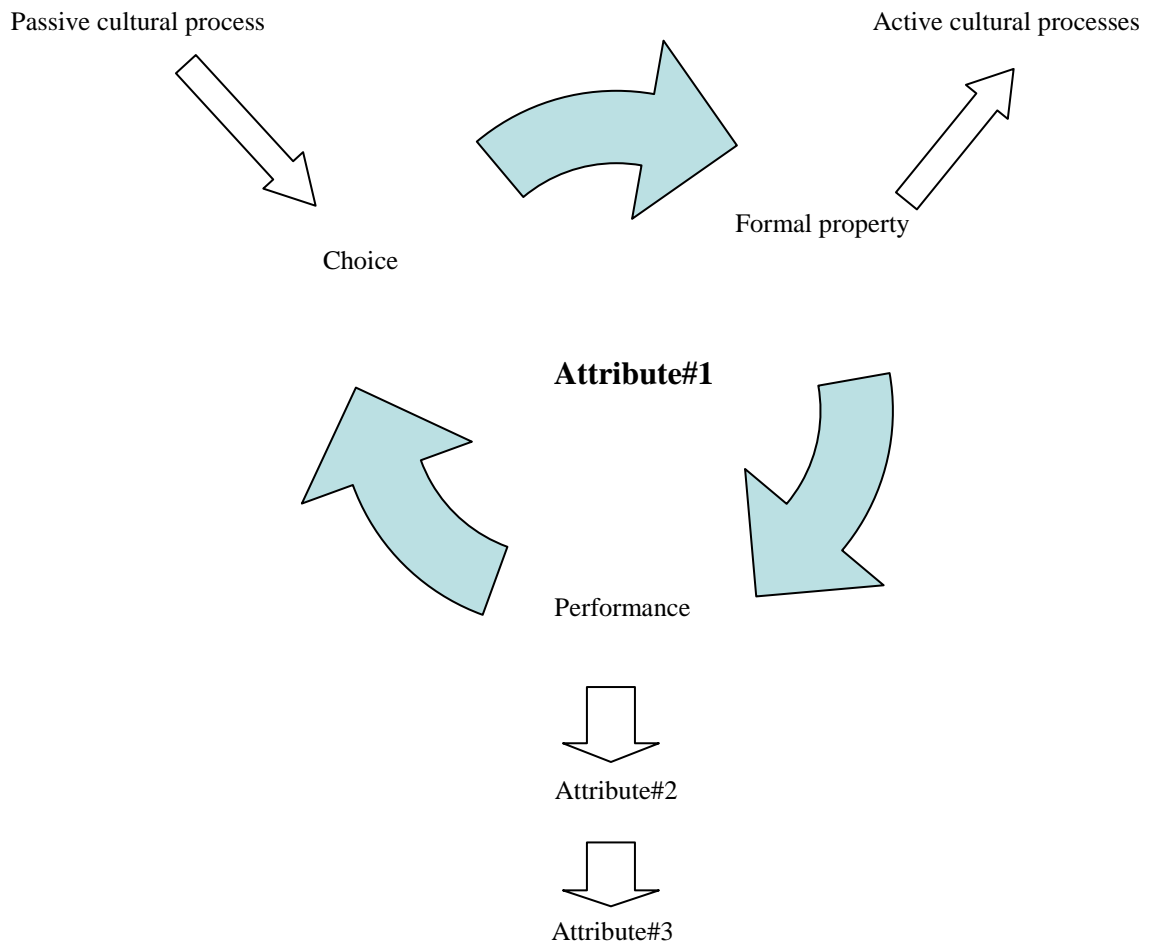
Most importantly, this kind of systematic approach, that identifies specific functional prerogatives and mechanical contingencies constraining variation, provides a means for understanding procedural flexibility or constraint, according to

which technical choices become a measure of the strength of cultural processes (see also Rouse 1960, Schiffer 1996; Neff 1993: 27).

Studies such as Pryor and Carr's are based on fieldwork with craft practitioners. For regional samples such as the one used in this study, whereby literally dozens of communities are involved and there is limited information on craft practices, a system such as the one outlined above provides a more feasible means of applying a technological approach. It seems likely that if such hierarchical orders can be derived from the sample, with distinctions from class through to attribute levels on a scale that grades from being most easily explained in terms of primary functional and operational objectives to those decreasingly shaped by mechanical and technical considerations, it will allow some determination of where performance and mechanical properties are analogous between two individual specimens.

Section Six

19. Method: **classifying the material culture**

19.1 Establishing the upper level class structures

In the previous chapter I discussed an approach to artefact analysis that would potentially enable the extraction of culturally significant values. I argued that the values must be determined according to their position within a framework of operational and mechanical interrelationships apparent within class parameters. This would align functionally and technically analogous attributes so that relative values can be compared across a sample.

The first step in the process was the determination of functional classes within the sample. This consideration of discrete functional properties serves no direct taxonomic purpose; rather it enables the establishment of categories whose members are most likely to demonstrate similar technological configurations and therefore provide similar sets of attribute levels.

The process started with a review of the sample of 8,414 objects including documentation, to assess the range of classes present and to check where there were sufficient numbers of objects for analysis. The determination of an object's functional membership necessarily included joint consideration of attributes associated with that object's *operational* mode and information concerning its intended *purpose*. Welsch et al.(1992: 571) sorted the A. B. Lewis collection 'to discriminate broad similarities and differences in usage'; however, as has been discussed above, although categories determined according to a broad notion of *usage* may seem sufficient for particular research questions, such notions often derive from an assessment of primary operational characteristics. Welsch et al's (1992: 574) classes (e.g. 'spears', 'string bags', 'bows and arrows', 'baskets' and 'earthenware') contain a number of discrete sub-classes, each of which provides a unique range of formal qualities (e.g. Froese 1985; Smith 1985). For example, the term 'arrow' denotes a projectile that is invariably shot from a bow and therefore accounts for all such objects that conform to this operational requirement regardless of what their makers may have considered their particular function. It is apparent, however, that any given community reliant on the arrow as an operational form, and to some degree individuals within that community, will possess a set of arrows that contains a considerable range of formal and technological variation, the majority of

which could be directly accounted for by discrete differences in function. It is common for most New Guinea communities to use arrows that are designed for hunting small animals such birds and lizards and some to hunt large mammals such as pigs. These somewhat different objectives result in significant formal differences between the arrows (Pétrequin and Pétrequin 1990; Sillitoe 1988: 122ff). Alternatively, any given individual may have two or more arrows that are more or less functional equivalents in that they are both specifically designed to kill a human victim but nevertheless facilitate two different ways of killing their victim. For example, one arrow may have a broad, sharp blade that will cause a large open wound and lead to a great amount of blood loss, while another may be pointed and narrow thus able to penetrate deeply into the victim causing damage to vital organs. As pointed out in Chapter 8 arrows can be additionally modified with barbs so as to be difficult to remove or with an incision around the circumference of the head (circum-incision) so that the head breaks near the tip. Such arrows may not be as effective in causing outright death but they are useful in that they enable lesser wounds to be effective by causing immobilisation or by ultimately claiming the victim through infection. These may be particularly effective when accuracy is not so assured such as when fighting is taking place between groups at distance as in open battle (Paul Roscoe pers. comm. 2008).

It is clear that much formal variation between members of the class is due to particular functional and operational objectives but even these have relative levels of importance. For example, it is sufficient that an arrowhead is either sharp or pointed for it to penetrate and have relative success in killing or injuring its victim, but in order for an arrow to stay lodged or leave a portion of its tip in its victim it must also be able to penetrate a victim sufficiently. With this in mind some basic head morphology is of primary functional importance and the barbs that enable an arrow to stay lodged in its victim or a notch or detachable tip that causes a section of an arrow to remain and cause infection are of secondary importance. Thus the first step in establishing a hierarchy of variables (attributes) for a class that comprises arrows needed to account for such characteristics and their relative position in a hierarchy of functional importance.

19.2 Accommodation of extrinsic data

The notions for upper level functional classes, with close regard given to operational properties, were initially derived from extrinsic data accompanying the objects. The first of these data were the descriptive and explanatory passages found within the associated collection notes or museum records. As was explained above, the quality of this information varied significantly from collector to collector and from museum to museum and often simple descriptive titles were the only information supplied or which had survived. I first allocated every object to what I had distinguished as general categories of social activities and consulted the combined notes for the sample so that I could tackle all candidates simultaneously. The establishment of these general categories was initially undertaken by reviewing the specific observations of Cranstone (1964a; 1964b; 1964c); Lewis (1963); Craig (1968a; 1969a; 1973; 1983), MacKenzie (undated; 1982; 1984; 1990; 1991); Morren (undated); and Hyndman (undated). These categories were then refined and positioned with additional ideas coming from the work of Sillitoe (1988) who sorted his material according to six major categories of social activities in which the objects were used.[77]

19.3 Accommodation of emic distinctions

I was also eager to incorporate information concerning the way in which local people differentiated class members according to formal difference. Much has been said about the comprehensiveness of plant and animal taxonomies used in traditional New Guinea societies. Diamond's (1966) often cited example concerning the zoological taxonomic system of the Fore of the Eastern Highlands of New Guinea clearly demonstrates that they discriminated animals at both lower levels, closely reflecting species and genera level taxa of modern zoology, and upper level taxa more directly pertinent to particular expediencies and social conventions. Diamond (1966: 1104) argued that such systems hinged on the single purpose of sorting useful species from non-useful. Upper level distinctions of animals used non-intrinsic characters such as hunt and consumption modes, while lower level

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[77] Sillitoe's compendium concerns the material culture assemblage of the Wola people of the Eastern Highlands of Papua New Guinea and is the most comprehensive inventory and survey of such an assemblage undertaken in New Guinea.

distinctions are founded on the need to discriminate species during predation via observation of salient phenotypic features:

> Why do the Fore distinguish closely related species of small, drab, nonutilized creatures such as scrub-wrens, instead of lumping them under one name? The explanation may be that such superficially similar animals may have quite different calls and habits, which the hunter must learn to recognize in order to guide himself to his choice of prey.

Essentially the Fore were lumpers, of animals that could be hunted in a similar fashion, particularly those that existed in a particular biotope, or consumed by a particular social class, or not at all. At the same time, they were splitters who used key attributes to quickly determine prey from non-prey. Therefore for any new species that the Fore may have encountered in their travels the most readily perceptible difference in phenotype would automatically give rise to a new class within the lowest level taxon because it would automatically provide an improvement in hunting strategy.

Hyndman (1979; 1984) and Morren (1986) have demonstrated that Mountain Ok fringe populations, who subsist across a very diverse range of environments, also impose similar taxonomies; for example, one such taxon is dedicated to pigs which are the focus of a very particular and popular mode of hunting, while all flying animals are group into a single upper level taxon (Hyndman 1979: 171-174). Phenotypic differences between species determine second and third level classification as was found for the Fore (e.g. Morren 1986: 125).

It seemed reasonable to assume that a similar system of nomenclature was being used for the artefacts, especially those with a broader range of purposes such as string bags and arrows. The subclasses that Sillitoe established within his broader functional categories were not derived from any notion concerning the objects' function but rather according to technical and physical particularities geared towards very specific operational and performance concerns.[78] One key for Sillitoe was the vernacular which often directly referred to these material or formal

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[78] For example, all arrows are classed according to arrow head characteristics (Sillitoe 1988: 112-153).

characteristics. Fortunately when it came to the project's sample, while many collectors had not provided much functional information many had provided vernacular terms. As there were substantial glossaries for Telefol, and to a lesser extent Mianmin and Tifal, I decided to look at Mountain Ok samples first. In most cases it became apparent that the vernacular term stood for an important formal or technical feature and/or the most important material used. Rarely did the vernacular explicitly refer to an object's function or operational mode. The terms were often compounds that consisted of morphemes for the predominant material and/or technical or physical characteristics that also distinguish from other objects that are functionally or formally similar. Often, for non-utilitarian objects, only the term for the predominant material used to fabricate the artefact was used. This was especially the case for things such as body ornaments where the vernacular referred to the feature that provided most aesthetic effect or was considered most valuable. Thus in many cases where collectors had obtained the vernacular for a particular necklace, nose ornament or the like, these made no reference to whether they were intended to be worn on a particular part of the body, but were simply a reference to the object itself, i.e. 'pig tail', 'pig tusk' or 'cowrie shell'.

Not surprisingly, the sample of arrows, being the largest for any functional class, included the greatest variety of terms. Sillitoe (1988: 112) observed that the Wola made 'fine distinctions between different kinds of arrows, largely on morphological grounds relating to their different usage, although sometimes on the basis of materials used alone'. In the case of Mountain Ok arrows it was also apparent that both material and technical attributes determined the choice of monomorphemic and compound terms and rarely was a generic term provided, nor endocentric compounds with morphemes that generically referred to arrows.[79] Nor was the intended target included as part of the vernacular. For example, arrows with prongs, commonly referred to as bird arrows by collectors, were commonly given terms in reference to the prongs and the material from which the prongs were made, for example the Wopkeimin term *dagigloom,* given for a sample of pronged arrows collected by Hyndman (undated)*,* literally translates as 'bamboo' *(dagi)* 'prong'

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[79] E.g. *un* which is the Telefol generic term for arrow.

(gloom).[80] Throughout the Telefol area, for which translations of vernacular was relatively easy to cross-reference due to the existence of a Telefol dictionary (Healey & Healey 1977), many single terms used to name arrows referred to one particular feature of the arrow or a type determined by attributes, for example: *daal/kanaat* (bamboo blade), *didi* (barbed bamboo blade), *dem* (four prong), and *belil/berir* (black palmwood).

Given the availability of glossaries and the relatively small variation within the Mountain Ok sample, it was possible to reconcile vernacular terms with particular arrow characteristics. The Abau, on the other hand, who provided a very large arrow sample, had a more diverse arrow assemblage accompanied by a greater variety of vernacular terms. Given there were no adequate glossaries available I let the terms sort the arrows.

I found that the vernacular also demonstrated a relationship to formal variation confirming that the large quantity of terms was in part due to the great diversity in pig and fight arrow morphology. Overall there were over twenty phonetically discrete terms for what collectors had determined as being 'fight'/'pig' arrows across the Abau language. The extent to which this is either due to the diversity in arrow type or to dialectical differences would be difficult to determine as most terms have extremely low counts thus making it impossible to test statistically.

Where samples were large Abau communities commonly had more than ten discrete terms exclusively for 'fight'/'pig' arrows. Consequently, even where the vernacular was not translated, I decided to use it to test criteria for subsequent levels of classification. The first obvious way in which arrows were most likely to have been differentiated was whether they were made with a bamboo blade or with a palmwood head. 134 out of 225 bamboo bladed arrows contained the morpheme *sik* the term for bamboo.

The next step involved exploring secondary tendencies in the vernacular and I chose bamboo bladed arrows as my sample. It soon became clear that emic types involved

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[80] In fact Hyndman claims that the term *dagi* specifically refers to a particular kind of bamboo that grows in the Ilam Valley where another dialect of Tifal speakers live, the Tifalmin, suggesting that particular varieties of bamboo were used in exchange between groups.

some conflation of blade material, form and secondary physical characteristics such as the nature and extent of barbing found on the blade. For example, the compound *yik/[h]wuk-s[y]ik*, in 30 out of 32 cases across eight Abau villages, and *maelaebwe/modbwe/motba,* in twenty out of 22 cases across five villages, account for long open bladed unbarbed bamboo blade arrows of which the total was 81. Nine phonetically unrelated terms accounted for the other 29 examples. The division between the use of either term corresponded with Martin's (1981) Abau dialect divisions, the former being used in the 'Up-River' dialect region and the latter in the 'Central' dialect region. The compound *s[y]ik-nas[i]* in 87 out of 89 cases across 17 villages and transcending putative dialect divisions was used for barbed and foreshafted bamboo blade arrows with attached thorns of which there were 95 examples in total. For non-bamboo blade arrows, the vernacular demonstrated similar tendencies. For example, arrows with detachable bone tips and incised notches to facilitate the breaking of the tip once the arrow enters the flesh, were unambiguously differentiated from those without notches by the vernacular.

There were different tendencies apparent for string bag terms. Maureen Mackenzie, for example, found that Mountain Ok nomenclatures

> clearly differentiated stages in the production of the bilum, and they define Telefol string bags at the level of gender. Those bilums defined by a focus on technical attributes, that is, by their principal form, are made by women and are essentially women's bags. Those categorised by the additional attributes are elaborated by men and are exclusively men's bags (Mackenzie 1991: 46).

The vernacular provided for the study sample, where translations were available, more or less followed these tendencies. The names for Mountain Ok adorned string bags were based on materials used to decorate them, e.g. *kon men,* consisting of *kon* (feather) and *men* (bag), is the generic term for men's adorned string bags, where a term such as *kabel men* (hornbill bag) specifically refers to the type of feather which in turn identifies the particular initiation stage the string bag was intended for. In cases where there was no ornamentation the vernacular sometimes included a

reference to a major looping technique or a technical characteristic.[81] Many collectors had provided vernacular terms and, where these were not generic terms they by and large reflected the tendencies identified by Mackenzie. Overall, however, the generic term was more commonly provided (e.g. *men* (Mountain Ok) or *auk[u]* (Abau)).

After a review of the vernacular I found that in the case of arrows the materials and then technical characteristics of the head, were the subject of the vernacular; in the case of bags, it was techniques and adornment. With this knowledge I established my artefact classes and determined which attributes were going to be considered first in terms of attribute level classes. After the scrutiny of the sample of 8,414 objects I was able to establish 15 categories each with two tiers of classification to account for operational/functional modes and variation in the significant material used (Appendix 23).

19.4 Accommodating intrinsic data: the identification of a sequence of class attributes

After an assessment of the vernacular to assist with the determination of sub-classes and key functional attributes, the next task was to model possible structures reflecting the mechanical properties of the objects. This required the identification of the components of each class and their relative positions within the functioning whole, including an assessment of size and proportion.

This was then followed by the provision of values for such components where they differ in choices made. As stated above, apart from Maureen MacKenzie who has published information concerning construction of string bag types from CNG, the ethnographies have not provided *chaînes opératoires* or descriptions of the craft practices associated with the artefacts. Instead, production sequences and decision steps have been inferred based on scrutiny of the objects, fragmentary information provided by the collectors, and from craft people with knowledge of the techniques. Most important of these were reconstructions by Jill Bolton of looping, braiding and knotting techniques used on arrows and string bags (Bolton and Fyfe forthcoming).

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[81] E.g. *aam bal men,* where *aam bal* refers to a separately constructed band for a bag's mouth (mouthband) (MacKenzie 1991: 53).

19.4.1 String bags

As string bags have a significant range of functions, and are used in several areas of social activity, it was important to first attempt to account for how these variations in function influenced the types and sequences of choices of the formal attributes. Size is probably the most crucial variable influenced by function and construction techniques for the body of the bag are also related to function. For example, certain looping techniques are preferred for bags according to size, although this certainly does not mean that any particular technique was exclusively used for bags of a specific size or purpose Indeed, as will be demonstrated later, many techniques were employed for bags that varied greatly in size and purpose.

A weighting or sequence of consideration for basic string bag components and features was constructed from available data (Appendix 24a). It appeared that the consideration of technical features was relatively evenly weighted beyond size. Large bags, of course, require a lot of strength and flexibility and this is ensured by an open looping technique and a reinforced edge or mouthband. Large bags also need strong, wide and stretchy straps and again these require specific kinds of looping methods.

Importantly, the use of pigmentation and appliqué was very much influenced by the intended function of a bag. Personal bags, especially those belonging to men, both in the lowlands and highlands, were more likely to have looped pigmented designs or applied features such as feathers, nuts or seeds etc. and, as has been discussed above, sometimes these had important social significance, especially in the highlands. The choice of pattern or appliqué also influenced the choice of looping technique.

On the other hand the way that a bag was constructed, or more specifically the way it was started, had some impact on the choice of techniques employed further along the production sequence (Appendix 24b). Four basic starting methods were identified and, as can be seen from the production sequence, these especially determined the way a bag was constructed and finished. The way that a bag was started or finished also had a considerable influence on how the straps were attached

but the range of choice concerning appropriate strap attachment methods is somewhat greater than the scope of alternatives found for features earlier in the sequence.

19.4.2 Arrows

Two principal components, providing two invariant attribute levels, are essential to the notion of *arrow* as a class: the shaft, which is the component that allows the arrow to operate as a projectile; the head, which enables the arrow to penetrate and cause injury to or otherwise incapacitate its intended victim. All other components act to either conjoin these or increase the efficacy and reliability of the arrow or, in some cases, simply to increase its aesthetic appeal.

Because all arrows are projectiles designed to incapacitate, and almost always to penetrate their target, it follows that an arrow's head is most crucial to an understanding of an arrow's function. Therefore classification directed at arrows should proceed by first accounting for variation in arrowhead morphology. New Guinea arrowheads can be primarily differentiated according to three tendencies of penetrative or non-penetrative contact with the target, these are: multi-penetration, which is facilitated by the use of pronged arrows and operates to achieve an increased tolerance for inaccuracy, and which is useful for small targets; single penetration, which is facilitated by a single head intended to cause a large or deep wound; and percussive, which is used to stun the prey so as to leave the pelt of the carcass intact.

These arrows are always intended for different categories of animals. The first being consumption animals that are small and quick such as small birds, lizards and fish; the second is intended for medium to large consumption animals, such as pigs, marsupials and cassowaries, as well as human targets; the third for small prey that provide a non-ingestible material resource such as skin and feathers. Sometimes the circumstances in which arrows are used is also important as this may influence the type of arrowheads; as discussed above some arrow head type may be more useful in skirmishes as opposed to open battles when fights occur.

To help to determine a possible sequence of attribute levels, as with string bags, a weighting and decision sequence was constructed for arrow components (Appendix 24c). What is clear is that the number of decisions is potentially greater than for string bags. The decision sequence is more hierarchically ordered because of the greater emphasis given to the arrowhead's functional importance. The decision sequence demonstrates that the size, material and formal characteristics of the arrowhead were paramount in importance, equally weighted and considered together. As with string bags, the decision to decorate an arrow was directly determined by function. Unlike string bags, the position and scope of decoration was largely determined by the structure of the arrow.

Next in the decision process was the choice of arrow structure, determined largely by the materials used for the arrowhead and the type of weighting regime considered appropriate. This determined the number and type of components and junctures present and these then determined the number and technique of the binding used.

The components of an arrow determined the scope of decoration applied. This was true both for applied elements such as feathers and pig bristles, and for the incised and painted designs. Some applied elements require certain binds to fix these onto arrows, and some binds may be decorative in themselves (see below).

While there was a great range in size and forms of string bags, the production sequences for arrows reveal the existence of a greater number of potential components and materials leading to more stages and individual steps in the process of making an arrow. While a particular arrow head and weighting regime determined particular set of components and specifications, placing constraint on the range of functional alternatives that could be employed further along the sequence, there were more points at which alternative modes could be used.

Three basic construction methods were identified, and as can be seen from the production sequences (Appendix 24d and e) these were determined largely according to choice of arrowhead or tip and weighting regime.

Formal modes that cannot be attributed as having some mechanical and technical significance within the operational structure of a functional class or consequence of mode of facture, provide the next range of diagnostic attributes. An object's decorative program is, of course, somewhat determined by the constraints or opportunities provided by morphology which is in turn directed by function. As was made apparent from the discussion in previous chapters, within this constraint there will exist a program that can be broken down into its constituent parts.

For string bags we use the example of the dyed pigmented designs. The designs found on the bags can follow a number of programs such as those including stripes, checks or stepped designs (see below). These are achieved by using different looping and dying techniques and these will be discussed further below.

Decorative features on arrow heads and foreshafts need to be approached in a different manner. Arrow heads and foreshafts offer a cylindrical format that enables the use of a linear pattern. There may be one major band that involves a large part of the surface area, or the decorated surface may be broken up into a number of bands, some of which may be subordinate to a dominant centrally placed band. Sometimes an arrow blade encourages the use of bounded motifs or designs. The design elements of the study area are numerous but there are many motifs or related motifs that are ubiquitous. As discussed above, motifs of the region are largely non-figurative and demonstrate geometries that are easily coalesced within the design structures.

The design structures for arrows can be notated according to the principles of plane pattern symmetry, as explained by Washburn and Crowe (1988). Their system provides notation for both finite design structures and pattern design structures, thus covering a wide and diverse range of decorated material. Notation for finite designs include: asymmetrical finite designs and finite designs with rotational and/or reflective symmetry - rotational being that in which patterned similarity is generated around a point axis. Finite designs fall into two classes, one being *cyclic,* that which has *n*-fold rotational symmetry but has no reflection symmetry, the other being *dihedral,* having reflection symmetry with *n*-fold reflection symmetry, in this case *n* also signifying the number of rotations (Washburn and Crowe 1988, 57). Washburn

and Crowe's (1988: 59) system provides seven possible, one-colour, one-dimensional, pattern notations (patterns that imply repetition in two opposing directions, i.e. across a line axis); these notations determine four senses of symmetry: glide, reflective, translation and rotational.[82] Craig's (1990) observation of two regional variants on the four motions of symmetry: horizontal linear agglutination of individual series of symmetrical elements, and compressed translation symmetry 'diagonally deflected symmetry', supplement these, enabling all design structures found in the study area to be coded.

The isolation of the design elements will also follow the work of Craig (1988: 45-52, 64, 65) who has determined a corpus of motifs for the two regions of the study area. These include the tendency for one-dimensional patterns to commonly include simple geometric elements that can be repeated along the course of a pattern; and finite designs have more elaborate polygonal elements.

The system can be demonstrated in the following diagram where the direction of the arrow follows the hierarchy of consideration:

Fig. 19.1 Diagram of decorative attribute levels for pattern designs.

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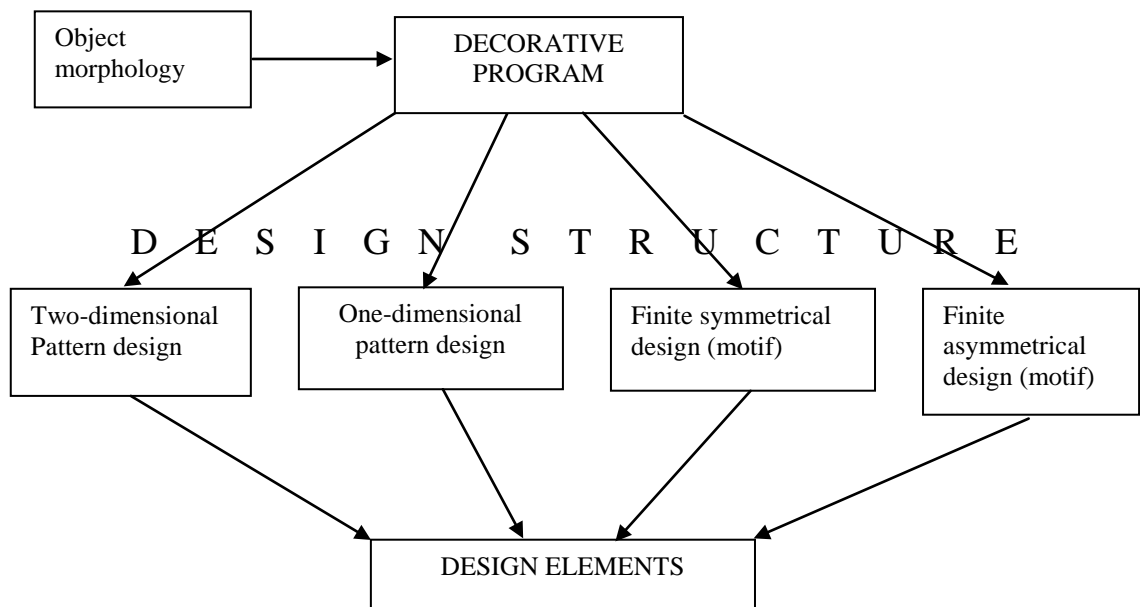
[82] Termed the four basic rigid motions (Washburn and Crowe 1988, 44).

19.4.3 Summary

The process of scrutiny and assessment, described above, is summarized in the following diagram:

Fig. 19.2 Hierarchy of artefact scrutiny and consideration for systemisation.

Category	A body of related social-activities in which the object is significant (e.g. hunting, gardening etc.)
Operational/Functional class	The operational/functional mode of object (e.g. arrow)
Emic classification	Most significant material or technical attribute implied as significant by the vernacular (in the case of arrows materials were most implicit; in the case of bags, techniques)
structure and mechanics	The structure of the artefact and the determination of its components and their interrelationship as determined by the artefacts operational and mechanical properties
Fundamental proportions	Size of artefact and its components
Technical attributes	Techniques and material used for the facture of components and subsidiary elements e.g. modes of arrow binding, bag looping etc
Decorative attributes	The format and content of decorative attributes

As will be demonstrated below, this provided a set of hierarchically arranged attribute levels with clear conceptual boundaries within which observable formal phenomena apparent in the sample of arrows and string bags can be meaningfully positioned. Conceptually, the hierarchy can be used in two ways: either to establish a set of attribute values according to the vertical axis to arrive at a type; or, to isolate attribute states along a horizontal axis to compare variation across what are more or less operational or mechanical equivalents with a similar level of technical constraint (attribute levels).

19.5 String bags: structure of systemisation

19.5.1 Dimensions and shape

The initial process involved creating meaningful divisions with which to sort the bags' range of sizes and dimensions, to provide some scope for factoring functional differences between the bags, and to gauge whether bag shapes had significant relationship to size. This is not to suggest that variance in size or shape is purely due to difference in usage, but rather that these variables are most likely to demonstrate a relationship with function.

A variable was then established comprising interval values for bag sizes. The relative bag sizes were determined by measuring the surface area of a bag when laid flat. As the flattened bags were rectangular, trapezoidal or semi-ovular in shape the determination of size was made according to a calculation of surface area for each of these shapes:

Rectangles: $width \times length$

Trapezoids: $\dfrac{\max width + \min width}{2} \times length$

Semi-ovals: $width \times length \times 0.8$

Tendencies in bag shape were derived in two ways. Firstly, through determining the ratio between a bag's height (length) and maximum width (SB-A-HTMXW) and that between maximum width and width of mouth (SB-B-MNTMXW), which enabled a good determination of the inclination of the bag's edges; and secondly, through bag construction technique (structure) which profoundly determines the shape of the bag's mouth and base. Of course, shape and size is also modified by usage: large string bags and medium sized loosely-looped string bags develop some convexity in their bottoms due to expansion during use but this variance is accounted for through the ascription of construction method.

19.5.2 Technology and form

From this pairing of variables a hierarchy of attribute levels to accommodate technological variation was then constructed in line with decision and production

steps outlined above. The structure (SB-C-STRCT), which was essentially the mode of construction, provided the inferential link between the formal qualities and the technical principals used to realise the operational unit. As can be seen from the production sequence, string bag structures followed four basic technical principals (Appendix 25a):

1) a mouthband was initially constructed from which the body was looped downwards and the base then completed by sealing the bottom edge of the looped cylinder with a row of looping SB-C-STRCT 1;

2) the body was looped upwards from a support cord with a circuit start or looped chain: SB-C-STRCT 2;

3) the body of the bag was looped up from an initial row or rows of looping: SB-C-STRCT 3;

4) a panel was looped, folded and secured along three edges: SB-C-STRCT 4

The first method tended to result in a shape that flared towards its base. The second and fourth methods resulted in a rectangular-shaped bag. The third method provided a relatively rounded base resulting from the successive loops widening to the required maximum width from the initial row, while the other methods resulted in flat bases.

The next set of attribute levels concerned the looping techniques used to make the fabric of the parts. These included: the looping technique for the bag's body (SB-D-BDLPG, Appendix 25b); the looping technique for either the mouthband or edging (SB-E-MTHFN, Appendix 25c), and that for the construction of the handle (SB-G-STRPLPG, Appendix 25e). As can be seen by the examples in the appendices nine looping techniques were identified in the study area sample, eight of which corresponded with techniques already identified by MacKenzie (1991: 215-217, Appendix 2a) and described in further detail by Bolton and Fyfe (forthcoming). The additional looping technique (LPG 2) had been previously reported by MacKenzie in the context of its use in two different methods of connecting the mouthband to the body of the string bag (MTHBDATT 3 and MTHBDATT 4, see below) but in the lowlands this technique is also used for SB-D-BDLPG. It may be thought of as a reversed-linked half-hitch, or as a figure 8 loop with no side linkage. It was found

in both plain and in patterned styles, where in the latter it was used to preserve a distinction between colours.

In addition to these, plain unspun bast fibre strips (PBF) were sometimes used for handles instead of looping. It is important to note that some variation was conflated within these looping categories, the most important being the figure 8 looping techniques (LPG 1) with various measures of openness. Two methods of achieving open looping in this way have been identified: firstly, the use of spacers in the form of pandanus strips, common in the highlands; and secondly, the use of tension, most commonly achieved by looping the bag around the legs or feet, a method common in the lowlands (Appendix 20l, see also MacKenzie 1991: 93, Plate 57). There is no unequivocal way of determining which method has been used beyond making an assumption based on where the bag came from and such assumptions are of course counterproductive to this exercise.

SB-D-BDLPG involved four looping techniques. In the case of SB-E-MTHFN, mouthbands were either looped as a sequence of short interrupted horizontal rows running perpendicular to the length of the band, achieved by using LPG 1, or as a continuous band, achieved by three different looping methods: LPG 5, LPG 6, LPG 7. Edging on the other hand was worked directly into the rim of the bag's mouth and generally followed two methods: LPG 8, LPG 9. Finally, as was stated above, looping methods for SB-G-STRPLPG were to some degree determined by the size of the bag and as bags decreased in size the variation in strap techniques increased. Aside from the use of PBF, there were four methods used for looping straps: LPG 1 was commonly used for large bags and LPG 6, LPG 7, and LPG 8 were often used for personal bags.

The third set of technical considerations involved identifying the methods with which the various parts of the bag – the mouthband, body and straps – were joined to achieve the whole. Where bags were looped up and finished with an edging these were always looped directly from the edge of the top of the bag cylinder. However, where a mouthband was used, either looped on or initially constructed to provide the frame from which the body of the bag was looped, it was attached to the bag in a number of ways (SB-F-MTHBDATT, Appendix 25d). The simplest method used,

MTHBDATT 1, is one where the top row of looping is worked directly into the bottom row of mouthband loops with each loop from the body carried once through those of the mouthband. Three other methods involve the use of groups of three to six vertical loops extending down from several rows into the mouthband from which the body was then looped. This method follows either of three tendencies:

1) short extended loops which would then twist on themselves before threading back into the mouthband (MTHBDATT 2);
2) longer extended loops with about two or three twists (MTHBDATT 3);
3) very long extensions involving six or more twists (MTHBDATT 4)

A final method (MTHBDATT 5) involved a row of chain of mesh (*tiim* to the Telefolmin) being directly looped into the bottom row of the mouthband and providing loops into which each loop of the first row of the body could be interlocked.

The ways in which straps were attached to the bag (SB-H-STRPATT, Appendix 25g) varied quite significantly over the study area and with bag structure. Straps could either be 'picked up', that is extended from the outer row of looping of either the mouthband or body, or they could include extended loops penetrating into the rows of the mouthband looping. Straps could also be independently constructed with their ends looped or threaded through the gap between the mouthband and bag. In all, strap attachment followed seven tendencies:

1) Doubled over and passed between mouthband and body (STRPATT 1)
2) Group of loops looped into space between mouthband/edging and body (STRPATT 2)
3) Picked up from body/mouthband perpendicular to the course of body/mouthband looping (STRPATT 3)
4) Picked up from ends of each of the two mouthband sections (STRPATT 4)
5) Picked up from joins of the mouthband sections (STRPATT 5)
6) Picked up from edging (STRPATT 6)
7) Continued from body (STRPATT 7)

19.5.3 String bag decorative attributes

The last three attribute levels concern the ways in which string bags were decorated. These attribute levels will not be used in the present study but it is appropriate to provide an outline of adornment at this point. The most important differences between the methods of string bag decoration were whether they involved appliqué or pigmentation or a combination of both. As pointed out earlier, across the study area the use of appliqué to decorate string bags involves a limited range of materials and they can be sorted according to whether they involve feathers, pigtails, string, shells or seeds (Appendix 20f-h). As discussed above, the use of pigmentation involved either painting mineral based pigments onto the surface or dying the string prior to looping.

As far as the first method is concerned, only two pigments are evident in the sample and these are white and red and are always applied as vertical stripes (Appendix 20a: Bas. Vb 23055). The second method, which was common throughout the USB and the Border Mountains, involved alternating various colours of string while looping the bag, and the kinds of effects that were achieved had very much to do with the either the choice and sequences of looping patterns used or the way the pigment was applied to the string during the looping process. These patterns were simple arrangement of horizontal stripes involving one or more colours, a horizontal arrangement of large rectangular shapes, or a 'check-like' pattern of smaller rectangles or squares.

Apart from the direct application of colour, the fibre or spun string may be dyed (usually by steeping) and horizontal stripes achieved by splicing in a colour and looping until it runs out, then splicing in more of either colour (Appendix 20i: Berl. VI 49887). A more sophisticated method involves working in a double spiral arrangement where two colours are worked simultaneously and alternately. This latter method leads on to the 'check-like' patterns mentioned above, where one colour is worked to the point where the colour change is needed, the second colour on the row below is then worked to a similar position, at which point the lower row colour is linked into the row above, and the top row colour drops down into the lower position. A block is worked on the top row, followed by its counterpart on

the lower row; the exchange is then performed again. The blocks may be as short or long as the maker desires (Appendix 20j: AM E64305).

Large blocks of colour are worked by looping in a discontinuous fashion backwards and forwards, by flipping the work as is done when looping a mouthband or a handle strip (Appendix 20j: PM 2652). The next colour is done similarly, but linking to the previous block as the new colour meets it. The stepped patterns are also worked in narrow, discontinuous blocks, similarly linking to the next colour as the looping progresses (Appendix 20j: PM E7485; Appendix 20k: AM 64595). Stepped blocks are found to be an odd number of rows high, in order that the separating stripe can be worked from left to right as normal.

The determination of these discrete tendencies in looped decorative patterns provided the final attribute layer for the hierarchy of string bag variables. This sequence was established from a comprehensive technical assessment. Obviously it could not possibly account for all formal variation but it provides a relatively inclusive set of variables with a meaningful range of values. This study will be using only the technological attributes of the string bags and will not involve attributes of bag decoration and adornment, as this sample was relatively small. In summary therefore the sequence of attribute levels for string bags used in this study is presented in the following diagram (Fig. 19.3).

Fig. 19.3 Attribute level sequence for string bags.

Operational criterion for string bag class: flexible and portable container made through looping spun bast fibre
Primary functional classes: intervals of size
Attribute level 1 and 2: SB-A-HTMXW and SB-B-MNTMXW
Attribute level 3: SB-C-STRCT
Attribute level 4: SB-D-BDLPG
Attribute level 5: SB-E-MTHFN
Attribute level 6: SB-F-MTHBDATT
Attribute level 7: SB-G-STRPLPG
Attribute level 8 SB-H-STRPATT

19.6 Arrows: structure of systemisation

19.6.1 Arrow classes and dimensions

The first level of arrow classification involved the determination of the arrow classes, each of which was provided with a discrete set of attribute levels. As was pointed out above, the upper level of arrow classes included three operational tendencies: *multiple penetrative*, *single penetrative* and *percussive*. From this point on, although a structure of attribute levels and their values was created to include variation across all primary functional classes, the discussion will only involve single penetrative arrows as the sample for multiple penetrative and percussive arrows was insufficient for the analyses undertaken in this present study.

Single penetrative arrows can be differentiated firstly according to major differences in the material used for the arrowhead/tip: bamboo (BBA), palmwood (PWHA, or bone (BTA), and secondly, whether their heads were bladed or pointed. As has been demonstrated through the appraisal of the vernacular, the most common criterion for arrow category amongst those who used the arrows was that which sorted arrows according to these two material differences.

The systemisation began with arrow dimensions and at this stage only two variables were used in the initial analyses: arrow blade/head length (A-BLD/HDLGTH) and whole length (B-WHLGTH), as these dimensions were common to all classes of arrow. As far as weighting regimes were concerned it was believed that foreshafts, stones and other forms of weighting would have been best measured in terms of weight, something that was not possible without taking the arrows apart.

19.6.2 Arrowhead form and modification

From this pairing of metric variables a hierarchy of attribute levels to accommodate formal and technological variation was then constructed in line with decision and production steps outlined above. The first of these concerned the shaping and modifying of an arrow's head. The shape of the head was determined according to its cross-section at maximum width.

For BBAs, blades (BBA-C-BCS) were shaped according to three tendencies (Appendix 26a):

1) A section of narrow-diameter bamboo is chosen and its culm is scraped leaving a semi-circular cross-section with a more tubular piercing point (BCS 1);

2) A section of a broad-diameter bamboo is cut and shaved to produce a thick, bevelled piercing point with a triangular-convex cross-section (BCS 2);

3) A section of a broad-diameter bamboo is cut and the majority of the vascular bundles within the culm has been shaved off to produce a relatively open, fine and very sharp blade with a slightly meniscoid cross-section (BCS 3).

For PWHAs and BTAs (PWHA-C-HCS and BTA-C-HCS), cross-sections at maximum width had a significant relationship with the nature of the barbing system and the modification involved, and the degree of tip enlargement or whether the head functioned as a piercing point or had a blade-like end. As the range of observable variation in barb morphology is potentially infinite it was important to determine and account for variation that resulted from a set of distinct technical principles. The two primary differences between the barbing techniques that are most evident are whether barbs are cut into a broad *pre-shaped* core, a process that leaves barb-like incisions, or whether the barbs are a result of the craftsman cutting back an *un-shaped* core at the end of a shaped stem, a process that leaves barbs projecting from a narrower cylindrical core. There was clearly a greater preference for the former in the highlands while the latter was the preferred process in the lowlands. The cross-section of the head core, barbing and stem chosen for the palmwood heads was therefore an important component of classification. The cross-sections not only determined the number of series of barbs that were found on an arrow but were indicative of how the barbs were incised. For example, a triangular cross-section provided three rows of barbs and a bi-convex cross-section provided two.

Finally, cross-sections of the head core stem were then used to determine the carving tendency of the unmodified core (PWHA/BTA-E-STMCRCS). Usually this was the same as PWHA-C-HCS and BTA-C-HCS, especially when barbs are cut into a broad pre-shaped core. But when the barbs are a result of the craftsman cutting back an un-shaped core, and when the end was bladed, the core stem was different enabling further differentiation of tendencies attributed to one or the other

technique. PWHA/BTA-E-STMCRCS and PWHA/BTA-C-HCS cores followed nine cross-sectional tendencies:

1) Round
2) Oval
3) Bi-convex
4) Tear drop
5) Plano-convex
6) Triangular
7) Rhomboid
8) Square

The next attribute level concerns how the shaped head or blade was modified beyond the basic blade form to include barbs, protrusions or circum-incisions in the manner outlined above and in Chapter 8. For BBAs head modification (BBA-D-BMOD) involved five tendencies (Appendix 26b):

1) unmodified (BMOD 1);
2) barbed along edges (BMOD 2);
3) barbed with thorns attached along centre of blade (BMOD 3);
4) shouldered (BMOD 4);
5) double sectioned blade (BMOD 5).

For PWHAs and BTAs (PWHA/BTA-D-HMOD), the heads were modified according to six tendencies (Appendix 26c and d):

1) Unmodified (HMOD 1);
2) single barbed tip (HMOD 2);
3) double barbed tip (HMOD 3);
4) series of barbs projecting at end of head (HMOD 4);
5) circum-incision (HMOD 5);
6) Series of barbs cut along length of head (HMOD 6).

The next step accounts for the structure of the arrow. As was noted above, the type of material used to make the delivery end plays a part in the determination of its structure. PWHAs and BTAs included a similar structure beyond the relative length of the head. The basic structures for BBA (BBA-E-STRCT) follow four different

tendencies that also determined the weighting of the arrow and to some degree its length (Appendix 26e). BBA-E-STRCT 1 presented a slight problem in that while all such bamboo bladed arrows had the blade directly attached to the shaft without any significant additional weighting component evident, apart from clay or lime sometimes being worked into the bindings, it was sometimes apparent that they were fashioned to include a short stem of wood, which reinforced the join between blade and shaft, but it was not always possible to determine the presence or absence of such a stem under the bindings. Therefore this class included some minor structural variation but it became apparent that binding classes would ultimately account for much of the difference within the class. The next three structural classes included:

> 2) the use of a foreshaft (BBA-E-STRCT 2);
>
> 3) the use of a pure palmwood shaft (BBA-E-STRCT 3);
>
> 4) the use of a small stone weight (BBA-E-STRCT 4).

The second technical attribute level encompasses the techniques involving the attachment of arrowheads to the shaft or foreshaft (F-H/BATT). There were three distinct tendencies for all of the arrows in the sample. These were either:

> 1) the insertion of the head into the shaft's culm pith cavity;
>
> 2) the attachment of the stem of the head/blade to the outside of the shaft or foreshaft; or,
>
> 3) the cutting of a deep notch in the end of the foreshaft into which the bamboo blade stem was inserted.

In the present sample, PWHAs and BTAs always involved the first method in their facture so this attribute level was redundant. BBAs only included the second and third methods which from here on are respectively: BBA-F-BATT 1 and BBA-F-BATT 2 (Appendix 26f).

19.6.3 Binds

Correspondent with the structures and co-joining systems outlined above were sequences of binding positions. The next step in the systemisation involved accounting for the presence and absence of binding at these positions plus the types of bindings present. There were fourteen binding techniques identified in the sample and these are described at greater length by Bolton and Fyfe (forthcoming). Five of these involved a whipping technique (Appendix 27a); five involved braiding (Appendix: 27b-d); two involved a knotting technique (Appendix 27e); and two used prefabricated bands (Appendix 27f).

The whippings involved either: a plain tight wind (Whip 1), a wide returning spiral wind which was then coated with a paste (as previously described (Whip 2), a wide returning wind over a plain wind (Whip 3), a close alternating wind (Whip 4), or sections of alternating winds over a plain wind (Whip 5).

The braiding samples were found to be various interpretations of the 'Turk's Head' Knot, used by leather workers for similar purposes. They are distinguished by the regular over and under pattern formed at the edges as the working strand exits and re-enters the braid (Braid 1). Braids may be tied in any length and interlacement. The two variations of infill braiding are Braid 2 and Braid 4. Braid 2 utilises an infill where the strand never exits the edge of the foundation and provides an over two/under two braid that runs perpendicular to the length of the arrow.[83] Braid 4 utilises an infill that regularly exits the edge of the foundation and usually provides either an over two/under two or over three/under three braid that runs parallel to the length of the arrow. Braid 3 is a simple 'Spanish Knot' while Braid 5 involves an infill of the Turk's Head that follows the same path as the first pass of the strand.

In the context of this essay a 'knot' involves a process whereby two working ends (as opposed to a single working end in the braiding) are used. The interlacements of these ends involve a regular twist between the strands, formed as the ends link together, after which they turn back. Knot 1 involves a process where the

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[83] Braid 2 was reported as being used by the Wola by Sillitoe who provided a description of the technique used (1988: 130, Fig. 40).

downward working end goes under two rows before returning.[84] For Knot 2 the downward end is only threaded under one row. The widths of the strands affect the appearance of these knots, as does the tightness with which they are worked. Increasing tightness induces a spiral effect, and exaggerates the height of the twist. This is especially so for Knot 2.

19.6.4 Bind positions (Appendix 27g)

The first position (BIND-A) corresponds with the requirement of attaching the shaft to the rest of the arrow construction. As the most common method of attaching the shaft was one where a palmwood head, foreshaft or variety of prongs are inserted into the culm pith cavity, this was determined as the primary position—the method of attaching prongs or blades that are fastened onto the outside of the shaft corresponds with the way that they were attached to foreshafts, so these bindings were conflated with the latter. BIND-A required a binding that tightens the reed shaft socket onto the thin cylinder of palmwood inserted into the culm pith cavity while preventing the splitting of the shaft. Braids were commonly used for this purpose because they could provide the tight and secure ferrules appropriate for a cylindrical juncture. Sometimes the braids are preceded by a plain wind in the same material, such as rattan, to prevent the braid slipping down the shaft. For some arrows, however, only a simple whipping is used and these are either applied with a series of knots—each of which secured a wind to the previous—or with the ends of the cord fastened underneath the wind proper. In other cases, a series of alternating winds, often of a relatively fine strip of fibre, are wrapped around the juncture and it was sometimes apparent, through comparison with other binds on the arrows, that such binds are not used in the original construction but rather to attach a new shaft or re-attach one that had come loose with use. The rudimentary nature of such binds suggests that they are a provisional measure or used by men who are not as proficient in binding techniques as the original arrow makers.

The second binding position in the sequence (BIND-B) is found for heads and foreshafts inserted into the culm cavity of reed shafts. This attribute level is somewhat problematic because it is most likely a conflation of two related but not

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[84] The technique for Knot 1 is also described by Sillitoe (1988: 131, Fig. 41).

necessarily functionally analogous binds. The position lies between the base of the palmwood head, at its juncture with the shaft, and the point at which the base of the palmwood head or foreshaft starts to reach its maximum width, typically before its midpoint. In most cases it is clear that binds here are intended to provide an additional buffer to prevent the impact of the arrow from causing the head or foreshaft to further penetrate and split the shaft. It is important to note here that examples for this binding position were very uncommon for foreshafted bamboo bladed arrows: presumably because a considerable amount of the impact sustained by these arrows would have been buffered by the bind at the juncture of the blade and foreshaft. Indeed investigation of foreshafts that sported this braid revealed that they were, in almost every case, recycled palmwood head arrows. In other cases BIND-Bs were clearly intentionally placed some way up from the juncture, and therefore could not have provided buffering so that function was not always intended. The reason that I believe that the two are related is that they are never found on the same arrow and that they appear exclusively on palmwood heads. I believe therefore that the second variant is a derivation of the first and has been adapted as a decorative feature.

The next binding position in the sequence (BIND-C) is found for bamboo bladed arrows and is used to secure the stem of the bamboo blades onto the foreshafts. It is also found on palmwood heads, but for palmwood heads it is a decorative device that mimics the use of such binds on bamboo bladed arrows. This notion of derivation is supported *firstly* by the fact that throughout the USB this bind position is almost exclusive to palmwood head arrows with long heads and bladed ends or barbs that project along the distal part of the head. In CNG, similar decorative binds are also a feature on thick heavily barbed tapering points, but are positioned a little further down the head. *Secondly*, the binds used at this position on both PWHAs or BBAs are of the same type. The bind essentially secures the end of the BBA blade stem to the end of foreshaft or shaft, or tightens the socket where a bamboo blade has been inserted into the notch cut into the foreshaft. The cross-section of this juncture is circular so a braid is commonly used.

Where no such binding is used, as in some cases where bamboo blades are attached to the outside of the foreshaft, the main blade to shaft/foreshaft binding (BIND-D) is

used to cover the whole of the stem. This bind, which is the next position in the sequence, secures the blade from the point where the shaft and foreshaft end at their juncture with the blade. The bind begins either on the foreshaft or shaft below the blade stem or, if a braid is present, at the upper section of the stem, and usually concludes one or two centimetres along the blade proper, well before the point at which the blade reaches its maximum width. The binding material used for this join is relatively supple and fine so as to be able to ensure a secure wrap around this difficult tapering juncture which progressively becomes a meniscoid cross-section. The most commonly used materials include bast strips, string, or narrow string bands that have been looped by women. The binding methods include a variety of winding techniques that range from simple sequences of plain concentric or alternating winds to those that consist of a layer of plain winds that are overlain with alternating or interwoven winds. Each particular variety of wind used at this juncture was usually given an adhesive coating to prevent unravelling. This coating was either tree resin, or resin combined with lime or clay which produces a cement-like paste. In the case of the latter, this compound was also provided additional weight to the distal end of the arrow (Kelm and Kelm 1980: 69).

The next bind position (BIND-E) functions to provide additional security at the end of the juncture between shaft/foreshaft and blade, while also securing feathers or pig bristles which are often set decoratively to fan across the frontal or rear plane of the blade. Bast fibres, string or looped string bands were commonly used, however, in the Border Mountains and Yellow River area, traded European cloth, largely brought by the Dutch (Gell 1975: 2), was also used and there was a strong preference for red cloth.

19.6.5 Arrow decoration

The final attribute levels were dedicated to the decorative tendencies apparent for arrows. As mentioned above, intricate designs were cut into the palmwood heads and foreshafts and design programs usually followed the somewhat cylindrical format of these components (Appendix 21d-f). As discussed above, the designs found on these arrows were geometric in character and often followed a range of pattern symmetries. Therefore the principles of notation outlined above were appropriate for accounting for much of the observed variation in design. Decorative

tendencies for arrows followed four attribute levels, the first accounted for the designs painted on the plane of the arrow blade. The next three levels accounted for designs found on the base of the palmwood heads and foreshafts and these adopted the three step pattern symmetry analysis outlined above.

At the time of the present analysis the coding for the arrow designs had not been completed so these attribute levels are omitted at this stage. Analysis of these will be undertaken in due time along with the analyses of string bag decoration.

The sequence of arrow attribute levels used for this study is summarised in the diagram on the page following (Fig. 19.4). The above process has provided eight attribute levels for the string bags and eleven for the arrows which cover a suite of components that are essential to the functioning of these classes. The following chapter will discuss the manner in which these attribute levels were used in a sequence of analyses to test for evidence of non-random relationships with language and distance

Fig. 19.4 Attribute level sequence for arrows.

```
┌─────────────────────────────────────────────────────┐
│ Operational criterion for class arrow: offensive     │
│ projectile shot with a bow                           │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Primary functional classes:                          │
│         1) Single penetrating tip (SP)               │
│         2) Multiple penetrating points (MP)          │
│         3) Percussive tip (PT)                       │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Secondary level functional classes (for SP):         │
│         1)  Bamboo bladed (BBA)                      │
│         2)  Palm wood head (PWHA)                    │
│         3)   Bone tipped  (BTA)                      │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 1 and 2: BBA-A-BLDLGTH and           │
│ BBA-B-WHLGTH/ PWHA/BTA-A-HDLGTH and                  │
│ PWHA/BTA-B-WHLGTH                                     │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 3: BBA-C-BCS/ PWHA-C-HCS             │
│ /BTA-C-HCS                                           │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 4: BBA-D-BMOD/ PWHA-D-HMOD/          │
│ BTA-D-HMOD                                           │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 5: BBA-E-STRCT/ PWHA/BTA-E-          │
│ STMCRCS                                              │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 6: BBA-F-BATT                        │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 7: BIND-A                            │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 8: BIND-B                            │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 9: BIND-C                            │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 10: BIND-D                           │
└─────────────────────────────────────────────────────┘
                          ↓
┌─────────────────────────────────────────────────────┐
│ Attribute level 11: BIND-E                           │
└─────────────────────────────────────────────────────┘
```

20. Analysis

20.1 Distance factors

Ultimately the attribute values used in the following analyses will be included in a larger dataset and entered into a GIS database, as has been done for the subsistence systems and the villages at which the objects were collected (see map, Appendix 6). These will be used to produce multivariate and univariate displays, including thematic maps of material culture distributions, languages, environmental and subsistence regimes, and will enable the rigorous quantification of distances between locations ascribed with material culture values.

On this issue there were two problems that confronted the team at the start of the project: firstly, few routes between villages were included on existing maps, and secondly, the diverse range of environments meant that any simple 'cost surface modelling' was inappropriate. Cost in movement is at least as much a function of terrain as it is of slope, regardless of whether there were established tracks. It was decided that the best way of arriving at a cost model that acknowledged both terrain and slope was to use the walking times.[85] The identification of least cost pathways will also involve the identification of major passes and particularly difficult terrain between districts. These will enable the construction of a network for the study area. Villages that are absent from such data will be made part of the network through extrapolation using the average of times covered for each kilometre over similar terrain.

20.2 Analysing the material culture attribute traits

Ultimately, matrices for material culture similarity could be created from the dataset and further analyses could involve such methods as Mantel tests of the correlation between matrices for language, distance and material culture similarity (e.g. Shennan and Collard 2005: 146). Because the system arrived at a sequence of discrete class and attribute levels, there is potential for a number of exercises beyond producing similarity/dissimilarity coefficients between assemblages belonging to different villages or languages. Partitive methods such as that applied to classes found in African cultural packages by Guglielmino et al. (1995: 7589)

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[85] Over the last two years the Project has secured well over 200 patrol reports and these, along with field journals of Barry Craig, provide travel times for almost all routes within each district.

would be practical for such data. In their investigation of the relative strengths of the transmission processes responsible for the contents of African cultural packages, they incorporated into their analysis nearest neighbour tests to determine the distance between groups sharing particular classes. This index established the degree of clustering according to shared attributes and allowed the quantification of the relative effect of language, distance and environment. It also provided a useful means to determine which classes were more likely to have distributions that were caused by 'cultural' as opposed to 'demic' diffusion. Another useful method would be the application of the previously mentioned log-linear methods used by Roberts et al. (1995: 771) to counts for particular classes or attribute levels to determine the degree to which language or distance separately accounts for departures from expected frequencies.

By the time the initial data processing had ended the distance dataset had not been fully resolved. I therefore decided to concentrate on a set of preliminary tests that would help to determine whether the material culture dataset exhibited a relationship with the key research variables, language and distance, keeping in mind the various sampling problems and biases that may be inherent in the sample as outlined in Section Three.[86] In this initial exercise languages were treated as nominal classes and assessments were made by comparing the relative position of each language in terms of material culture similarity to that of their respective linguistic relationship shown in the language matrix (Table 9.2). Assessment of the effect of distance was determined from a comparison with the languages' respective geographical positions (Appendices 4 and 5).

20.2.1 Correspondence Analysis (CA)

To explore the contributions made by either mobility or conservative cultural processes to the patterning of attribute values, it was decided that frequencies rather than presence/absence data would be used. The proportion of objects at any particular site may in some cases reflect the importance of that object type to the community and a lower frequency of attribute types (proportional to the total number of examples within that attribute level found at any one site) may be

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[86] Analysis was undertaken using SPSS version 15.0

indicative of exchange with sites where that attribute type occurred more frequently. Correspondence analysis (CA) was chosen because it is a useful tool to factor and explore the association between discrete (categorical) values, and therefore ideal for formal and modal attributes belonging to string bags or arrows (Shennan 1988: 283-288). Some of the most useful applications of CA have intentionally sought to identify clustering of material culture classes. For example, Moore and Romney (1984: 385) found that some classes in the Welsch et al. dataset clustered according to either Papuan or Austronesian language families. More recently, Jordan and Shennan (2005: 183) used CA on data involving the relative use of traditional basketry techniques and language divisions in Northern California and had similar results in that clusters determined by cultural similarity reflected linguistic affinity for languages belonging to three of the region's four language stocks.

CA quantifies and illustrates association between discrete categories by measuring relationships between rows and columns in two-way or multiple-way frequency tables. This enables the establishment of scaled distances between categories according to their relative scores along the sequence of corresponding rows and columns. As expected values are those in which rows and columns demonstrate complete independence from one another, the sum deviation from expected values will give an x^2 value. Dividing x^2 by the number in the sample (n) provides a measure of this deviation. CA provides a means of extracting several factors and their dimensions that individually account for a percentage of this deviation; the two dimensions accounting for the greatest percentage of this inertia can be used as axes to construct a map onto which the column or row values can be plotted. Another important feature of CA is that it is also appropriate for tables that include zero counts. As it was common for the artifacts of some groups not to include attribute states that were apparently common to others, and zero counts were particularly evident in the data and considered highly significant for the present study because of the likelihood that they were an indicator of cultural discontinuities, this feature was especially important.

20.2.2 Analysis of variance (ANOVA)

The other method chosen for this exercise involved the use of analysis of variance (ANOVA) which is appropriate for exploring relationships between variables comprising continuous metric data and categorical data (Foster et al. 2005: 16ff). These tests would determine whether there was any significant difference between language group means in both the string bag and arrow samples. Analysing variance within the sample is done by comparing means' differences with variation due to random error (within-group sum of squared deviations (*SS*)). In such tests, overall variance for the samples' dependent variable(s) mean is calculated as *SS* from the overall mean, divided by the number of the sample minus one (*n*-1). Adding together the sums of squares within each group provides the *Error* variance, and subtracting this from the overall *SS* provides the Means Square Effect. Under the null hypothesis, within group and between-groups variance should be statistically equivalent; an *F* test is used to compare the two estimates of variance to establish whether there is a significant difference between groups.

Aside from the determination of significant difference between group means, another important feature of an ANOVA is that if the tests proved to be significant, the dependent variables can then be submitted to post-hoc tests. These provide pair-wise comparisons of groups' means and homogeneous subsets of groups whose means are not significantly different under the terms of the chosen α-level.

20.3 String bags: analysis

There were 397 bags for the nine languages included in the analyses and the number contributed from each language area is shown in Table 20.1

Table 20.1 Number of string bags according to language.

Language	String bags
Abau	53
Bimin	47
Faiwol	24
Mianmin	12
Namie	51
Oksapmin	67
Telefol	47
Tifal	51
Yuri	45
Total	397

Unlike the arrows, string bags were analysed as one class. This was because there was no important material difference between the bags and because there was no adequate way of determining any functional divisions beyond that determined by size. As bag structures and techniques transcended any possible divisions for size and as the sample was much smaller than that for the arrows, the partitioning of the sample in such a manner would have been somewhat arbitrary and impractical, and would have compromised the analysis. The metric analysis of the string bags provides a practical and sufficient means with which to explore such divisions while also providing some assessment of the manner in which size impacts on bag morphology.

Plots and tables produced by the analytical procedures are placed at relevant points throughout the text. Tables accompanying the string bag correspondence analyses are provided in Appendix 28 according to the sequence they occur in the text and additional plots and tables for the ANOVAs are provided in Appendix 29.

20.3.1 CA for string bag attribute levels

1. SB-C-STRCT

The first CA for string bags involved the way the bags were structured according to construction technique (SB-C-STRCT). As demonstrated in the previous chapter, there were four construction tendencies apparent in the larger sample and all are represented in the sample for analysis.

When compared to the map of the positions of languages in geographic space (Maps Appendices 4 and 5) and the language matrix (Fig. 9.2) the plot (Fig. 20.1) reveals surprisingly strong relationships to both distance and language, with the lowland groups positioned over to the left hand side of the plot and the highland groups forming a chain to the right. Importantly, in terms of language, the Tifal and Telefol, and Namie and Abau, are clustered while the Yuri and Oksapmin are positioned at the fringes of both dimensions. The Mianmin, who according to the language matrix are the most diverged of the Mountain Ok languages, are clustered with the groups of the south-east division of CNG. The crucial factor for this plot is the difference in the relative use of STRCT 1 and the uses of STRCT 2 and STRCT 3. The use of STRCT 3 is determining the positive values within Dimension 1 and this popular choice for constructing amulet bags is part of the reason for the cluster to the right. The Yuri's isolation can be largely explained by the greater use of STRCT 4 for the construction of pocket bags.

Fig. 20.1 Correspondence analysis plot showing relationship between language groups in terms of SB-C-STRCT attribute state frequencies.
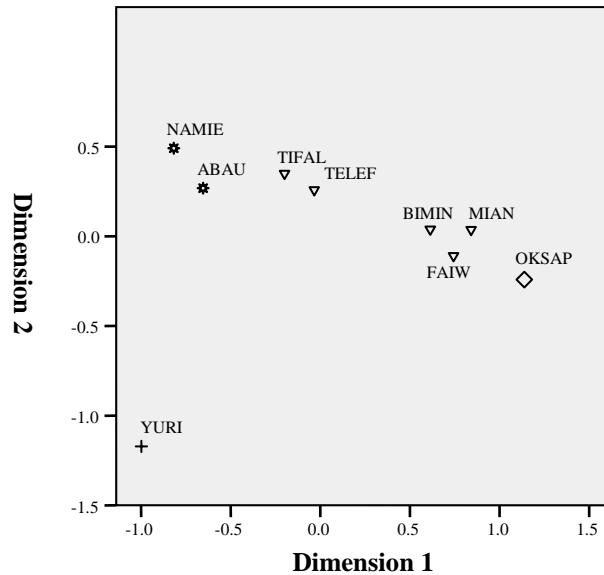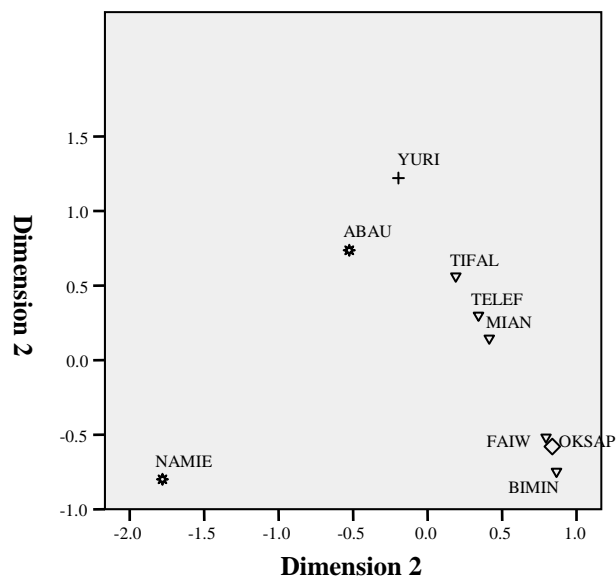
Key: ✳ Sepik Family ✚ Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

2. SB-D-BDLPG

The second CA for string bags focussed on the counts for choice of looping method for bag bodies (SB-D-BDLPG). Looping methods followed four tendencies in line with that found for the entire sample from the study area. The CA plot (Fig. 20.2) exhibits tendencies similar to the previous level although we now see the Mianmin join a cluster including the Telefol and Tifal while the Faiwol, Bimin and Oksapmin form another cluster asserting the division between the south-east region of CNG and that of the centre/north-west region, which is pretty much in line with social and geographical divisions – in the context of this chapter I am referring only to the Papua New Guinea side of CNG. The lowland groups again demonstrate a degree of isolation from these clusters with the Namie now on the fringe. This plot suggests a very strong distance factor with only the Yuri's position within the CNG north-west cluster disrupting this pattern.

Fig. 20.2 Correspondence analysis plot showing relationship between language groups in terms of SB-D-BDLPG attribute state frequencies.
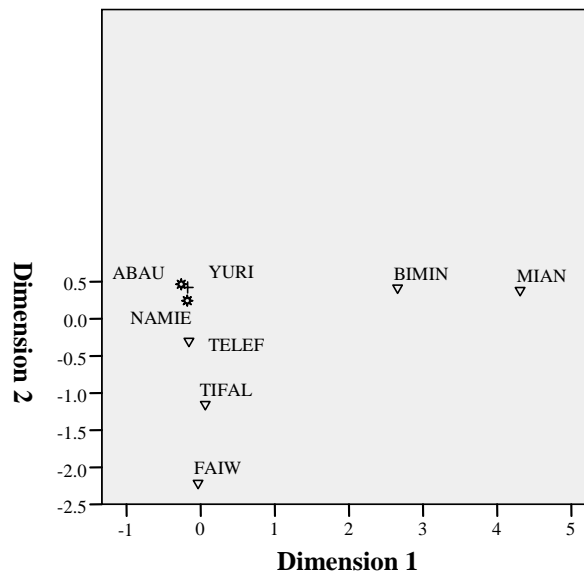

Key: ✳ Sepik Family ✚Language Isolate ▽Mount. Ok Family ◇ TNG Phyl. Isolate
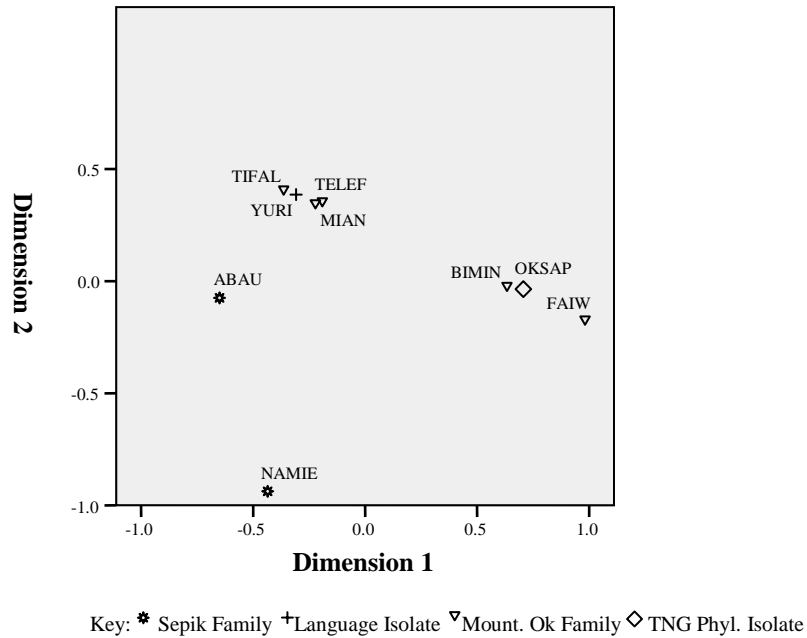
The greatest factors in this plot are firstly, the proportionate uses of LPG 1 to LPG 4: the eastern and southern CNG groups tend to make more bags with LPG 4 and tend to use this method for pocket bags whereby the north-west Mountain Ok groups more commonly use LPG 1 for this purpose. The same can be said for the Yuri whose SB-C-STRCT 4 are always made with LPG 1. The second factor is the use of LPG 2 by Namie communities, a looping technique they use on many sorts of bags, and the fact that their sample demonstrates a tendency to use a greater variety of techniques than the others.

3. SB-E-MTHFN

The third CA for string bags involved frequency data for the looping technique used for the edgings and mouthbands for bags where mouth finishing was present (SB-E-MTHFN). There were 339 bags with mouth finishing in the sample of 397. The lack of the attribute, i.e. a lack of mouth finishing, could not be considered a value for this attribute level because almost all the bags without mouth finishing were small amulet and pocket bags for which an edging would have been impractical.

Six discrete edging and mouthband looping techniques were used in the quantified sample in line with the larger sample and these have been discussed in the previous chapter. The plot (Fig. 20.3) again splits CNG into south-east and north-west regions, with the lowland groups again somewhat removed from the highlands, but with the highlands groups more tightly clustered. Again social and geographical distance is unequivocally implicated by the plot with language not seeming to exhibit any effect beyond that which could be better explained by distance.

Fig. 20.3 Correspondence analysis plot showing relationship between language groups in terms of SB-E-MTHFN attribute state frequencies.

Key: ✻ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

The factors shaping this plot are, firstly, the proportionate uses of mouthbands in construction as opposed to edgings, especially in CNG. Edging is a far more popular method in the south-east while mouthbands are more popular in the north-west. Preferences show a predominant use of LPG 8 and LPG 9 in the eastern part of CNG and LPG 1 in the west. Secondly, in the lowlands there is almost no evidence of edging apart from a few bags collected from the Abau. This has pulled them to the left in Dimension 1. Thirdly, differences between the lowland groups, largely due to preference for either the use of LPG 1 or LPG 7 for constructing a mouthband, has led to the Namie, who exhibit a strong preference for LPG 7, again being isolated in line with their social distance from the other groups.

4. SB-F-MTHBDATT

The fourth string bag CA used data concerning the way in which mouthbands, where present, were attached to bags (SB-F-MTHBDATT). Mouthbands were used by all groups in the study area except for the Oksapmin and 184 bags out of the 397 sample included this attribute level. As discussed in the previous chapter, edgings were more or less looped similarly into the edge of a panel or cylinder of looping while mouthbands were connected to the bags in a number of ways, especially when they were used to start the bag. In the greater sample we saw that five tendencies were identified and all five of these were evident in the quantified sample. The plot (Fig. 20.4) again splits CNG into two groups but this time the Mianmin and Bimin are together while the Faiwol are closer to the Telefolmin and Tifal.

Fig. 20.4 Correspondence analysis plot showing relationship between language groups in terms of SB-F-MTHBDATT attribute state frequencies.

Key: ✱ Sepik Family ✛ Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

What must be considered when reading this plot, however, is that the Bimin, Faiwol and Mianmin predominantly edge their bags. Therefore their samples are small and some may consist of traded bags: the Faiwol, while more socially linked to the east did have important trade relations with the Telefolmin. On the other hand, the Mianmin and Bimin bags with mouthbands are constructed from the bottom up with

mouthbands attached after construction which would suggest they are locally made. The innovation of using the mouthband this way may have come from lowland groups who use this attachment method but usually with bags looped as cylinders with the bottom edge sealed after construction. Another feature of the plot is the close relationship between the Tifal and Telefol. These two groups exclusively use mouthbands as the start for body construction so this relationship is to be expected. Importantly, the lowland groups, who all use a variety of methods, closely cluster.

5. SB-G-STRPLPG

CA number five for string bags used the frequency data for strap looping method (SB-G-STRPLPG). This was a large sample covering all types and sizes of bags; only two straps were missing leaving a sample of 395. As discussed in Chapter 18, there were five methods of strap looping identified for the greater sample; all five were apparent in the quantified sample. While this CA may be affected somewhat by the fact that the strap looping method is influenced by bag size – there were a considerable number of amulet bags collected from some CNG groups – the largeness of the sample and the fact that the looping techniques used in larger bags were used for smaller bags meant that the data are still likely to reveal meaningful patterns.

Indeed the plot (Fig. 20.5) again reveals evidence of an east/west division within CNG but this time the Bimin and Tifal gravitate from their usual highland cluster towards the lowland groups.

Like the Oksapmin, the Bimin have a penchant for making small amulet bags so it appears that size ratios within the sample have not affected the plot significantly. The Yuri, Abau and Namie again maintain their familiar positions with the Namie isolated from the rest. The most important factor in this plot is whether and in what proportion groups are utilising LPGs 1, 6 and 7 for their smaller bags' straps. LPG 6 is only evident for bags from the centre/north-west of CNG, that is in the Mianmin, Telefol and Tifal samples. The prevalence of amulet bags which often sport LPG 7, results in the convergence of the Faiwol and Oksapmin. The cluster of the Yuri, Abau, Tifal and Bimin is due to similar proportions in the use of LPGs 1 and 7. The

Namie are isolated largely through their use of LPG 8 and PBF for smaller personal bags.

Fig. 20.5 Correspondence analysis plot showing relationship between language groups in terms of SB-G-STRPLPG attribute state frequencies.
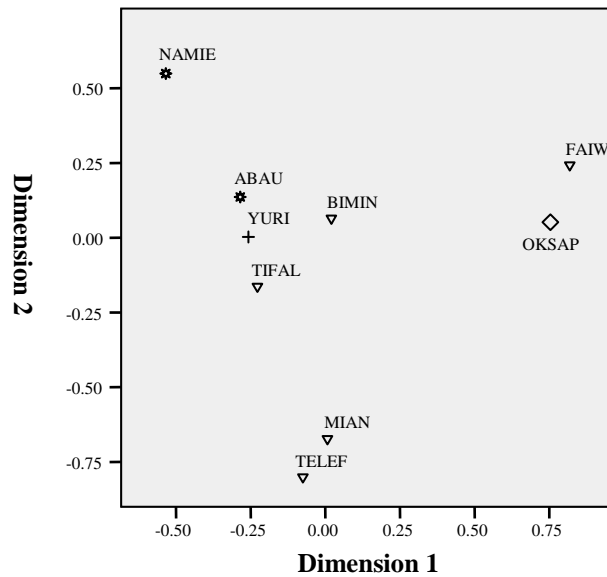

6. SB-H-STRPATT

The sixth and final CA for string bags focussed on the manner in which straps were attached to the bags (SB-H-STRPATT); again the sample was 395. As outlined in Chapter 18, seven distinct tendencies were identified in the larger sample and all seven were present in this sample. This attribute level expectedly would have some relationship with the way that a bag was constructed (SB-C-STRCT) and the form of mouth finishing (SB-E-MTHFN) so readers are encouraged to compare the plots (Figs 20.1 and 20.3).

The plot (Fig. 20.6) reasserts the south-east and centre/north-west division within CNG with the Bimin and Tifal rejoining their clusters. Again the Yuri, Abau and Namie maintain their familiar position in relation to the highland groups. Importantly, the Abau are positioned as the pivot between the highlands and the lowlands, reflecting the relative position in geographical space. Social and

geographical distance is again unequivocally implicated by the plot and again language does not appear to have any effect beyond that which could be better explained by distance.

Fig. 20.6 Correspondence analysis plot showing relationship between language groups in terms of SB-H-STRPATT attribute state frequencies.
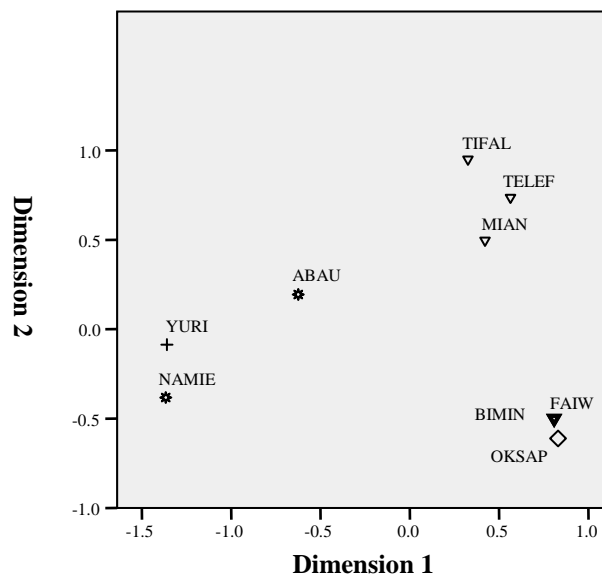
Key: ✳ Sepik Family   + Language Isolate   ▽ Mount. Ok Family   ◇ TNG Phyl. Isolate

The most important factors in this plot are, firstly, the prevalence of STRPATT 1, 2, 3 and 5 in the lowlands and STRPATT 4 and 6 in the highlands. These latter two techniques are also used by the Abau, resulting in their gravitation towards the highlands groups. What splits the highlands groups is that STRPATT 4 and 6 are used equally in the west while STRPATT 6 dominates in the east, STRPATT 4 being rarely employed there.

20.3.2 String bags: metric data and ANOVA

The string bag sample's proportions were subjected to a series of ANOVAs (Appendix 29). These included the variables of the ratios, in terms of percent, of height to maximum width (SB-A-HTMXW) and of minimum width to maximum width (SB-B-MNTMXW). Four of the bags' bodies were incomplete, meaning that the initial sample was 393.

Given the great variance in size within the sample, and the obvious relationship between size and function and size and sampling, the relationship between size and language was not quantified. Rather boxplots of the 393 bags' sizes were created for both language and ratios to gauge proportional tendencies and determine whether sampling problems had resulted in the unequal distribution of functional subclasses across the languages and whether these would present problems for the analyses. The boxplot for size to language (Fig. 20.7) revealed that there was considerable difference in the size of the bags between groups as well as number of outliers.

Fig. 20.7 Boxplot for string bag size according to language (n=393).
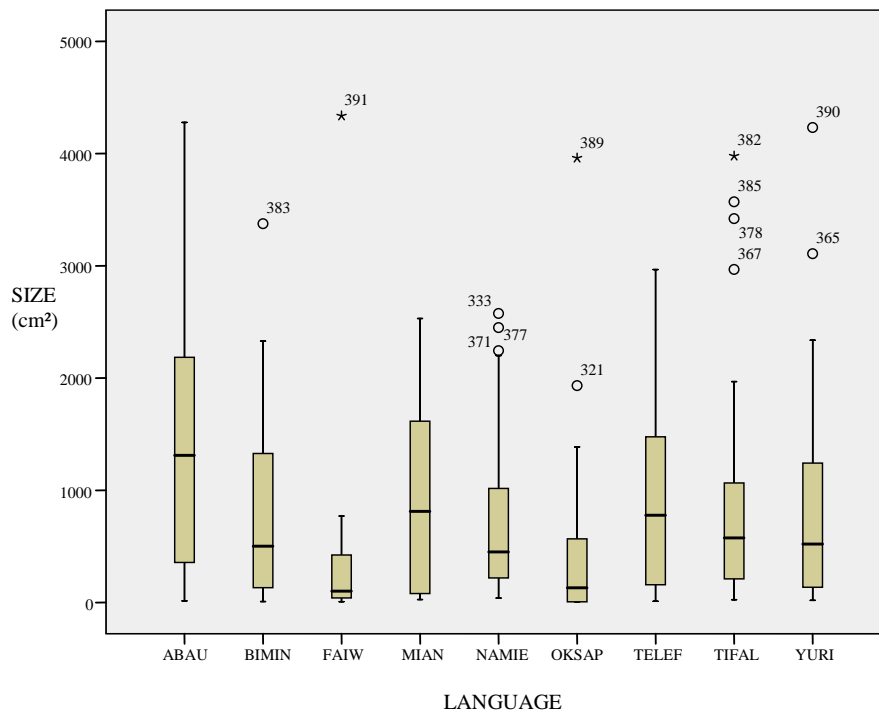
The boxplot clearly indicated that irregular sampling had occurred across the study area and that a number of functional subclasses were likely to be poorly represented for some languages; this was most clearly evident for both the Faiwol and Oksapmin samples. The boxplot for bag construction method (STRCT) and size (Fig.20.8), which was most likely to be directly related, indicated similar problems although it was apparent that STRCT 4 and STRCT 2 construction methods were more likely to be used for much smaller bags.

Fig. 20.8 Boxplot for string bag size according to SB-C-STRCT (n=393).
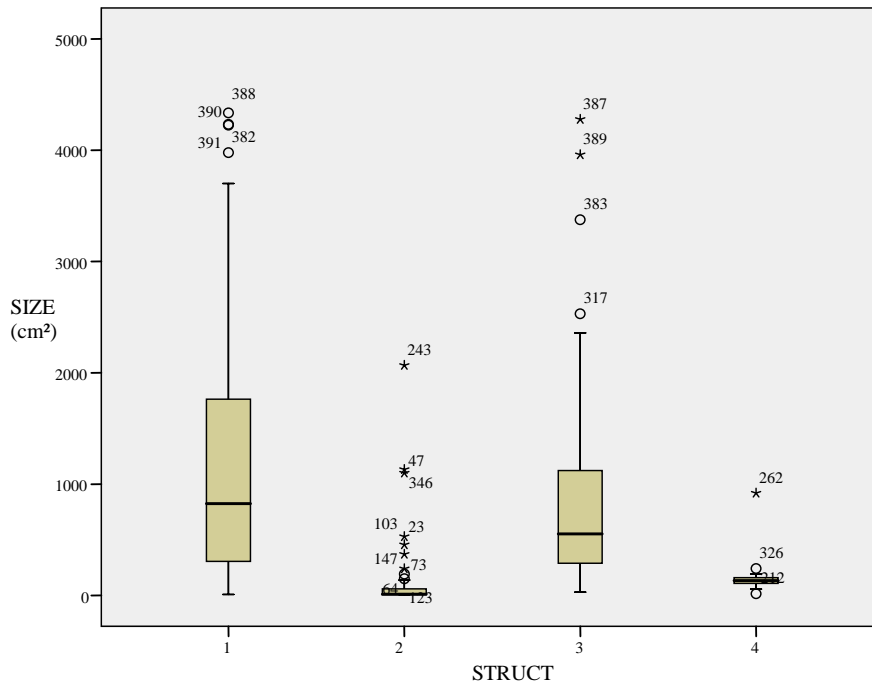
A boxplot (Fig.20.9) for bag construction method, this time involving HTMXW, indicated that bag proportions did not vary greatly according to the way that the bags were made but great variance was found for STRCT 2, which was understandable because the proportions of very small bags such as the amulet bags, for which this method is commonly used, are not overly constrained by functional concerns, indeed curious shapes are commonly used for such bags – for example the fingered amulet bags of the Baktamanmin (Appendix 20e: Barth 35a).

Fig. 20.9 Boxplot for SB-A-HTMXW ratio variance according to SB-C-STRCT attribute states (n=393).
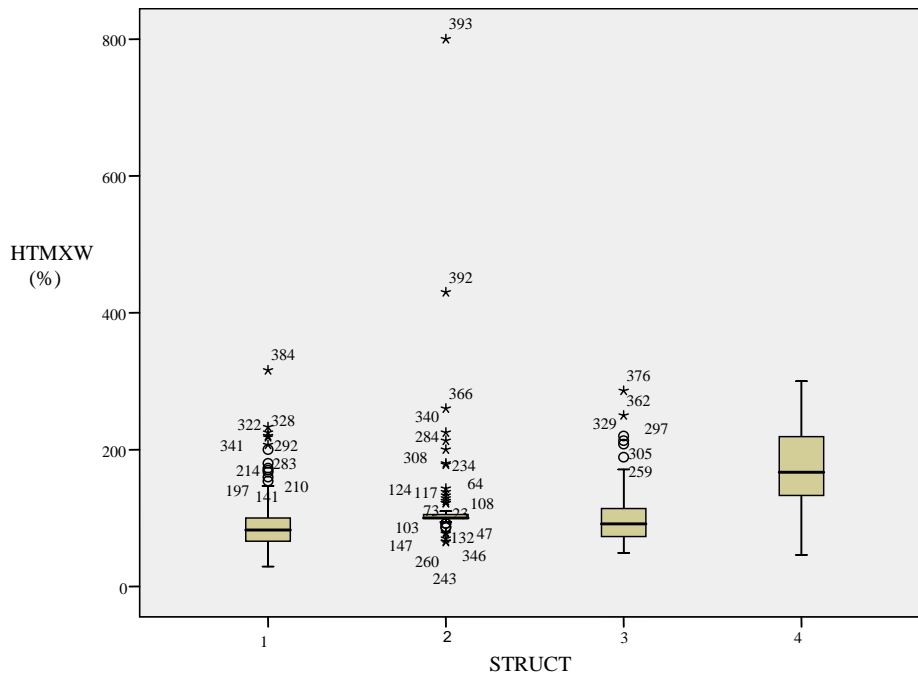
A second boxplot for bag construction method and proportions (Fig.20.10), this time involving MNTMXW, revealed the existence of a similar lack of constraint for STRCT 2 while at the same time great constraint (minor variation) in the dimension of variance for STRCT 4, a method also used for small bags, in this case pocket bags. In this case the lack of variance for STRCT 4 is a function of the construction method as it involves an initial panel of looping followed by folding and sewing of the sides and therefore little scope for the proportions to diverge from a one to one ratio.

Fig. 20.10 Boxplot for SB-B-MNTMXW ratio variance according to SB-C-STRCT (n=393).
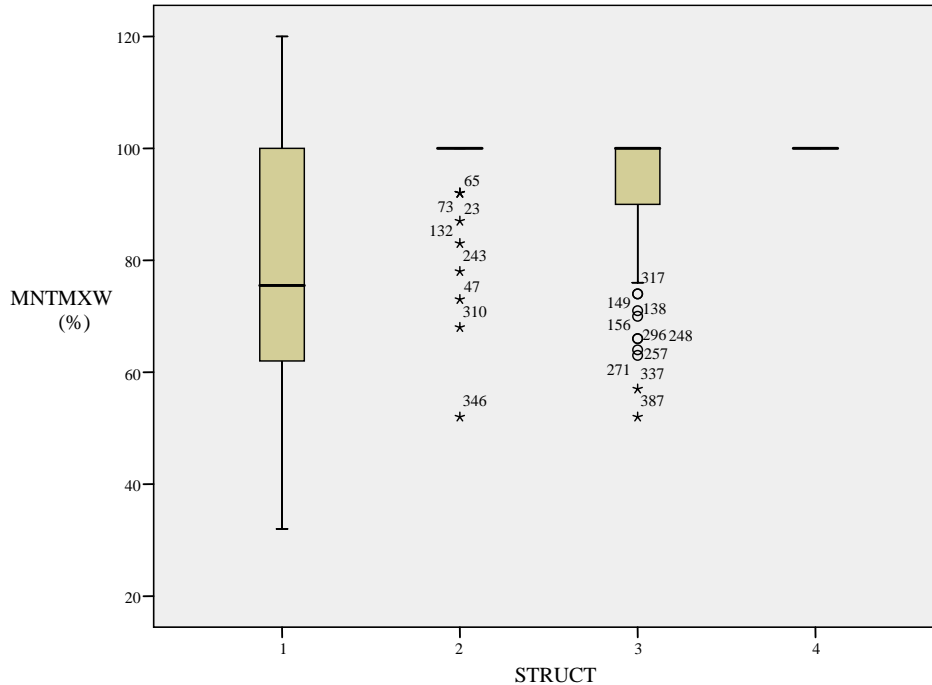
The first solution to the problem of testing the sample for any significant variance between groups was therefore to remove STRCT 2s and STRCT 4s from the sample. The second solution was to remove significant outliers evident in the first boxplot (Fig. 20.7) and for STRCT 1 and STRCT 3 evident in the second boxplot (Fig. 20.8). It was decided to leave in outliers for STRCT 1 and STRCT 3 apparent in the third (Fig. 20.9) and fourth (Fig. 20.10) boxplots for they were less likely to be due to functional difference and they were not as extreme as the others as they fell within acceptable Mahalanobis distance values. This left a sample size of 305 bags, a reduction of 88 bags.

The first analyses to be undertaken were one-way ANOVAs involving HTMXW and MNTMXW as the dependents and language as the independent variable. As a parametric test, ANOVA works best when certain assumptions are met. Firstly, the observations should be independent of each other. Secondly, it is more robust when the dependent variables are normally distributed. Thirdly, there should be

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homogeneity of variance across the groups in terms of scores. However, all three dependent variables for the STRCT 1 /STRCT 3 sample, especially size, demonstrated skewness even after the sample had been remodeled and Kolmogorov-Smirnov scores were all below the .05 significance level. New boxplots for language and proportions revealed that in the new sample there were only outliers for one group in MNTMXW, the Oksapmin, whose sample demonstrated very little variance due to a preference for one to one ratio bags. Consequently these outliers were left in. On the other hand, there were significant outliers for HTMXW grouped according to language, so these were removed leaving a sample of 284 bags for the HTMXW sample (Appendix 29a). This resulted in a sample that provided more normal ranges in variance for HTMXW and MNTMXW, as illustrated in the boxplots for HTMXW to language (Fig. 20.11) and MNTMXW to language (Fig. 20.12).

Fig. 20.11 Boxplot for SB-A-HTMXW ratio variance according to language (n=284).
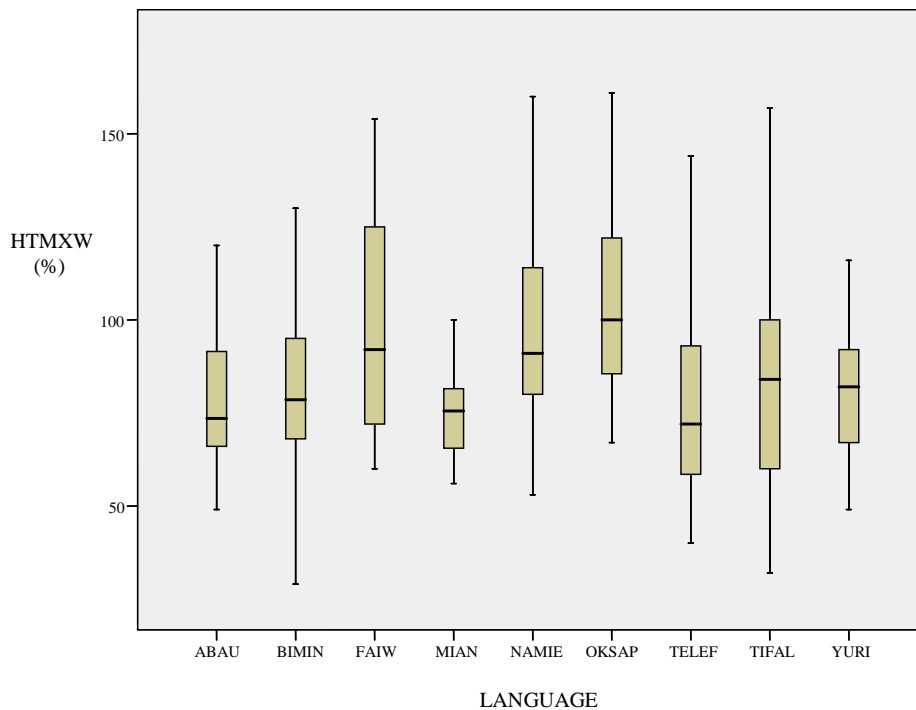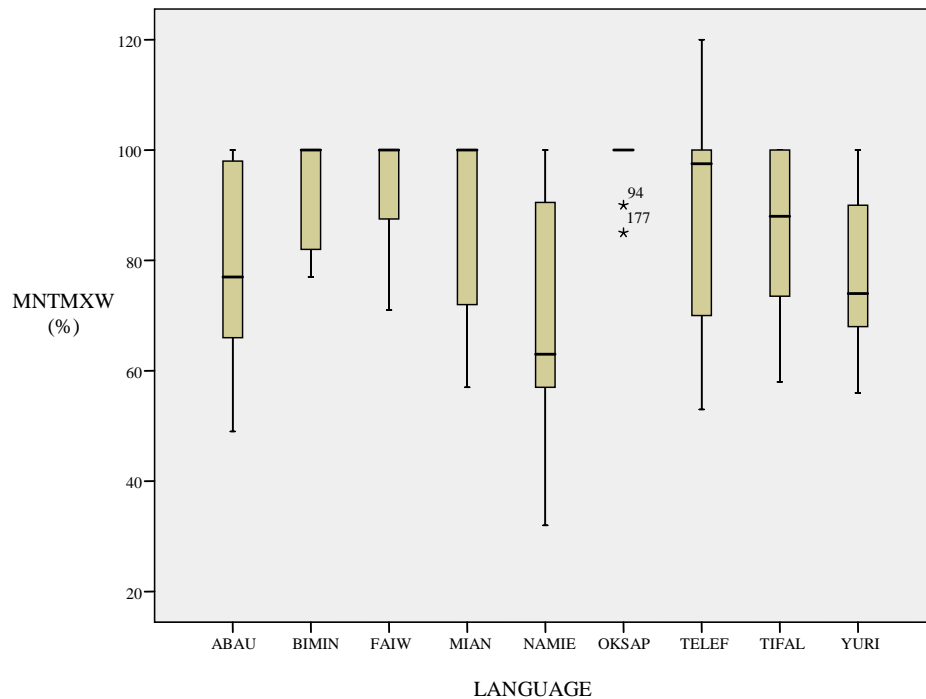
Fig. 20.12 Boxplot for SB-B-MNTMXW ratio variance according to language (n=305).

Histograms revealed that while HTMXW was closer to a normal distribution and had relatively little skewness or kurtosis, MNTMXW was skewed due to a prevalence of bags of equal width across their proportions. Nevertheless, as the sample sizes were large it was considered that ANOVA should be relatively robust under these circumstances (Foster et al. 2005: 17; Tabachnick & Fidell 2007: 80).

As would be expected under such circumstances the sample did not satisfy assumptions of homogeneity of variance across groups. The Levene's Test p-values for both HTMXW and MNTMXW were under the α-level of .01 but again this does not necessarily discount the validity of the ANOVA (Rogan & Keselman 1977). The discrepancy in the equality of variance for MNTMXW was largely due to the Oksapmin sample which included 33 bags. Nevertheless the Oksapmin mean was still only 0.9 from the group mean. The smallest group sample – that collected from Mianmin speakers, had a standard deviation of 16.86 which again is close to that of the sample at 17.56.

F-test results for both HTMXW and MNTMXW and language gave a p-value <
.001 well below the α-level indicating a rejection of the null hypothesis that there is
no significant difference between the groups' means. The ANOVA also provides a
means of gauging the strength of the relationship between the dependents and
language in terms of means difference, in other words how much of the variance is
explained by language. This is given as the effect size (eta-squared or η^2) which is
calculated by dividing *between groups SS* by *total SS*. As a rule of thumb .01 is
considered a small effect, .06 a medium effect and 0.14 and over a large effect
(Cohen 1988: 284ff). The η^2 values for HTMXW and MNTMXW gave .14 and
.26 respectively.

Inspections of post hoc tests produced with the ANOVA, however, reveal little
evidence of the relationship between between-group HTMXW means and language
affinity. There is also little indication that distance had any effect and it can be
assumed that this variable is most strongly related to function (Appendix 29h).

On the other hand there were more evident non-random patterns apparent in the post
hoc tests for *between group* differences concerning MNTMXW means. The relative
differences in *between group* means appeared to be strongly related to distance and
groups at the extreme ends of the distance scale ― Namie, Oksapmin and Bimin ―
demonstrate the greatest difference from overall group comparisons. The table for
post hoc homogeneous subsets again demonstrates the same lowland and highlands
clusters as found for CAs using nominal variables (Tables 20.2 and 20.3). Note also
that the Namie and Oksapmin are at the peripheries of the scale.

Table 20.2 Homogeneous subsets of languages with related means for SB-B-MNTMXW ratios, α = 0.1.

Tukey HSD

LANGUAGE	n	1	2	3
NAMIE	51	70.10		
ABAU	49	78.39	78.39	
YURI	26	78.50	78.50	
TIFAL	47	85.45	85.45	85.45
TELEF	42		85.83	85.83
MIAN	11		85.91	85.91
FAIW	12		93.33	93.33
BIMIN	34		93.68	93.68
OKSAP	33			99.24
Sig.		.013	.013	.040

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 25.173.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

At an α-level of .05 subsets again reflect the south-east and centre/north-west clusters that were observed for many of the string bag CA plots. Beyond these clusters it is important to note Subset 3 which includes all languages of the Mountain OK family.

Table 20.3 Homogeneous subsets of languages with related means for SB-B-MNTMXW ratios, α = 0.5.

Tukey HSD

LANGUAGE	n	1	2	3	4
NAMIE	51	70.10			
ABAU	49	78.39	78.39		
YURI	26	78.50	78.50		
TIFAL	47		85.45	85.45	
TELEF	42		85.83	85.83	
MIAN	11		85.91	85.91	
FAIW	12			93.33	93.33
BIMIN	34			93.68	93.68
OKSAP	33				99.24
Sig.		.533	.678	.562	.890

Means for groups in homogeneous subsets are displayed.
 Based on Type III Sum of Squares
 The error term is Mean Square(Error) = 218.383.
a Uses Harmonic Mean Sample Size = 25.173.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

20.4 Arrows: analysis

There were 1,389 arrows for the nine languages included in the analyses and the number contributed from each language area is shown in Table 20.4. CAs were first undertaken on the relative frequencies of the major arrow subclasses: bamboo blade (BBA), palmwood head (PWHA), and bone tipped (BTA). These were then followed by separate analyses of the formal characteristics belonging to the arrowheads of each subclass as the choice of material meant that technical differences between the subclasses were not appropriate at this level.

Table 20.4 Number of arrows according to class and language.

Language	BBA	PWHA	BTA	Total
Abau	225	115	105	445
Bimin	8	18	0	26
Faiwol	6	28	0	34
Mianmin	36	40	20	96
Namie	58	79	91	228
Oksapmin	19	42	0	61
Telefol	75	95	0	170
Tifal	48	103	0	151
Yuri	74	64	40	178
Total	549	584	256	1,389

Plots and tables produced by the analytical procedures are placed at relevant points throughout the text. Additional CA tables for arrow CAs are provided in Appendix 30 and additional plots and tables for the ANOVAs are provided in Appendix 31.

20.4.1 CA for arrow attribute levels

Arrow Subclass

The first CA for arrows (Fig. 20.13) analysed the relative frequencies of arrow classes collected from each group. It was found that there were two distinct clusters containing either highlands or lowland groups. What is also apparent in the plot is that the Mianmin exhibit a greater affinity with lowland groups when it concerns the preference for subclass, which is probably due to their recent expansion into lowland territories.

Fig. 20.13 Correspondence analysis plot showing relationship between language groups in terms of arrow class frequencies.
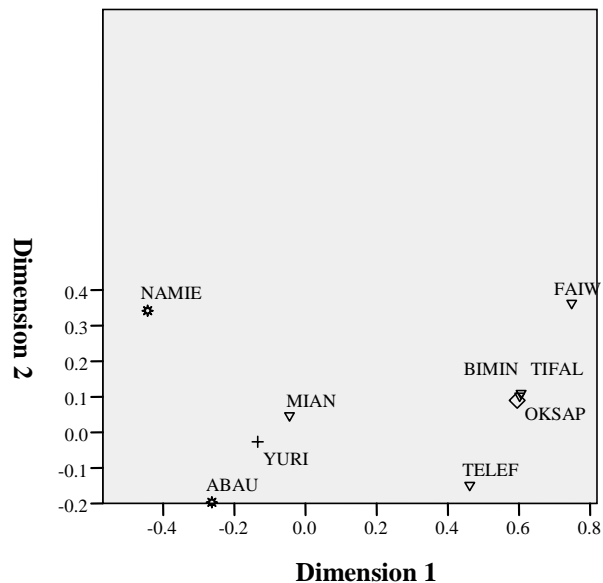
The crucial contributing factor to this plot is the almost exclusive use of BTAs by lowland groups. The proportion of BBAs to the other subclasses is more or less the same for lowland and highland groups at forty-two and forty-three percent respectively which indicates that the BTAs were more or less an alternative to PWHAs for use in warfare.

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**20.4.1.1 Bamboo bladed arrows (BBA)**

The first sequence of analysis involving arrow attribute levels involved BBAs. This class provided the most attribute levels as it includes the greatest number of possible components. The sample for BBAs included 549 examples; 523 were whole arrows, 22 were arrows with foreshafts and missing blades, and there were an additional four arrow blades. Four attribute levels were chosen for this class: the cross-sections of the blades (BBA-C-BCS); modification of the blades (BBA-D-BMOD); arrow structure (BBA-E-STRCT); and blade attachment method (BBA-F-BATT).

1. BBA-C-BCS

The first CA focussed on BBA-C-BCSs. The three tendencies evident in the sample of 527, discussed in Chapter 18, were either a strongly beveled thick culm sectioned blade, broad and fine open blades, and the more tubular blades facilitated by the smaller varieties of bamboo cane. The CA plot (Fig. 20.14) revealed three loose clusters with the lowland groups tending towards the left side of the plot; a tighter cluster including the Telefolmin, Oksapmin and Mianmin in the top right hand corner of the plot; and the three other Mountain Ok groups tending towards the bottom right hand side. These last three have geographic distributions that tend towards the western and southern region of the cordillera. As will be demonstrated by a later analysis, this will be partially related to the difference in arrow construction techniques.

Taken individually, the three clusters, viewed according to the two-dimensional plot, exhibit some relationship to distance although the relative positions of the clusters themselves do not. On the other hand the relative values within Dimension 1 for the highland groups and lowlands groups do reflect language.

Fig. 20.14 Correspondence analysis plot showing relationship between language groups in terms of BBA-C-BCS attribute state frequencies.
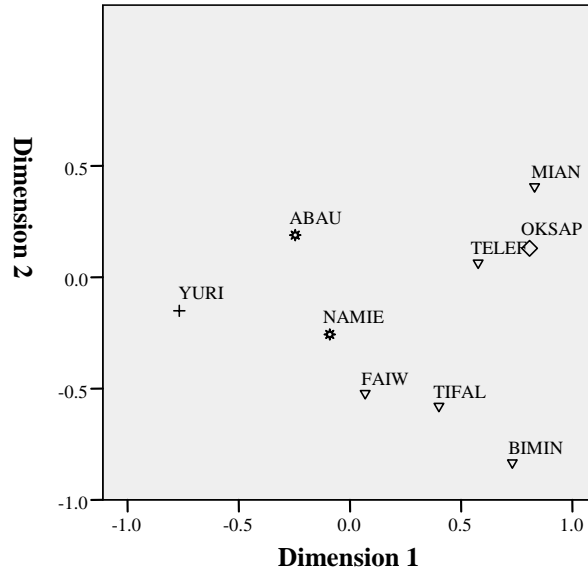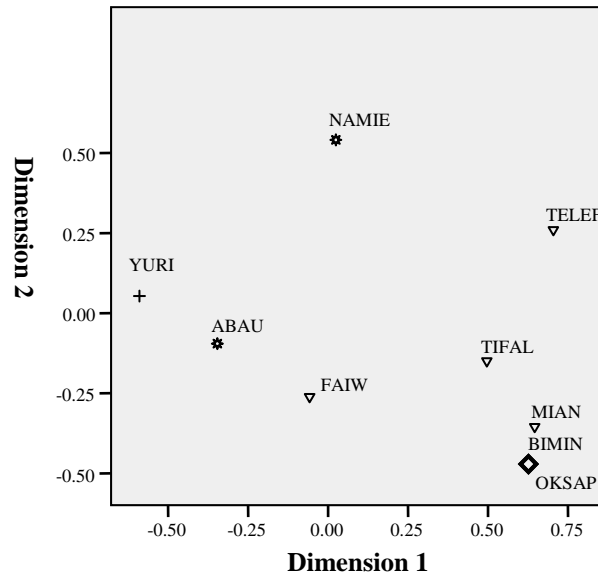

Key: ✿ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

2. BBA-D-BMOD

The second CA involved an analysis of BBA-D-BMOD. The sample included frequencies of all five tendencies described in chapter 18. Again the CA plot (Fig. 20.15) has lowland groups clustered towards one side of the plot reflecting a greater tendency to modify their blades with barbs and thorns than in the highlands. The two languages towards the top of the plot, the Namie and Telefol, diverge from the rest in that they more commonly provide a blade with a single row of barbs along one edge, a tendency that the Namie share with their northern neighbours, as apparent from scrutiny of the larger study area sample. Apart from the position of the Telefol, the plot would suggest that distance again appears to be the strongest factor, especially when the highland and lowland groups are considered separately.

Fig. 20.15 Correspondence analysis plot showing relationship
between language groups in terms of BBA-D-BMOD attribute
state frequencies.

Key: ✳ Sepik Family ✛ Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

3. BBA-E-STRCT

Bamboo blade arrow structure (BBA-E-STRCT) is the next attribute level in the
sequence. The test sample of 549 lacks one attribute variant within the larger sample
that was described in Chapter 18, the stone weighted variety (STRCT 4), which is
used in the northern plains and Border Mountains. Therefore only STRCT 1, 2 and
3 are part of this analysis.

The CA plot (Fig. 20.16) reveals a cluster for highlands groups in line with a
stronger reliance on foreshafted BBAs and, although the samples for the socially
close Faiwol and Bimin speakers is small, the fact that these neighbouring groups
cluster with the unrelated Oksapmin language, with whom the Bimin interact
strongly, is notable. The most distinct outlier is Mianmin which, although close to
the other Mountain Ok languages along Dimension 1, demonstrate a divergence
along Dimension 2 due to the number of pure palmwood-shafted arrows.

Fig. 20.16 Correspondence analysis plot showing relationship between language groups in terms of BBA-E-STRCT attribute state frequencies.
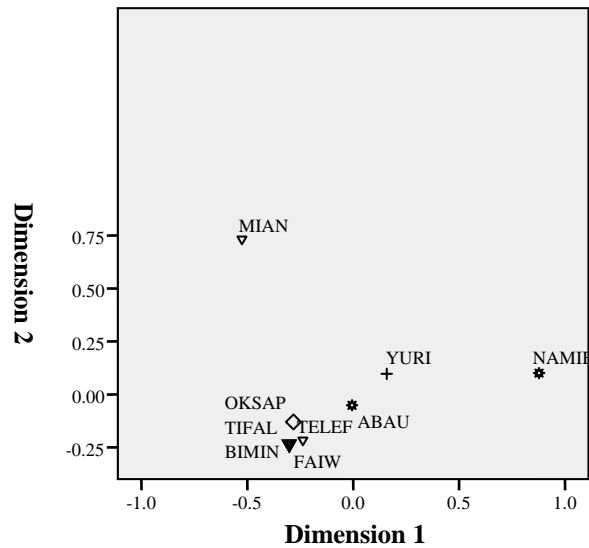
Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

The plot again reveals what appears to be a strong relationship with distance with possibly a smaller factor determined by ecology. Also, apart from the Mianmin, the lowland and highland languages pattern together according to their relative positions in space.

4. BBA-F-BATT

Within the present sample for bamboo blade arrow attachment method (BBA-F-BATT), only two alternatives are present for the sample of 549. Inertia is accommodated in a single dimension. Scores within the dimension revealed a very isolated cluster including the contiguous languages, Mianmin, Telefolmin and Oksapmin in eastern and north-central sectors of CNG. All other languages clustered relatively closely and distantly from this cluster. The Mianmin, Telefolmin and Oksapmin BBA-F-BATT cluster reflects a heavy reliance on the notched foreshaft method of attaching the blade stem; a technique rare in samples from other groups in the study area. This cluster, which I call from here on the Notched Foreshaft Culture (NFC) represents probably one of the most significant to come out of these tests. As far as arrow technology is concerned, adoption of the NFC not

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only required a different foreshafting system, but also a greater portfolio of braiding techniques. So, although the languages are contiguous, the co-occurrence of this culture is a little surprising considering the Oksapmin speak an entirely different language and all three language groups demonstrated considerable enmity towards each other for what appears a considerable time prior to pacification. On the other hand, the spread of this technology may have been due to this conflict. Occurrence of notched foreshafted arrows in the Mountain Ok west and south of the Telefolmin is rare or non-apparent and observations suggests that it may have come from the east or north east through the Duranmin who also use this arrow technology.

20.4.1.2 Palmwood head arrows (PWHA)

PWHAs were subjected to a similar regime of tests; there were 584 arrows in the sample. Three attribute levels were chosen for this class: the cross-section at the arrowhead's maximum width (PWHA-C-HCS); modification of the arrow head (PWHA-D-HMOD); and PWHA head core cross-sections (PWHA/BTA-E-STMCRCS) which is conflated with that for BTAs, for these are technically analogous and therefore included in one CA.

1. PWHA-C-HCS

The first attribute level CA undertaken for PWHAs is PWHA-C-HCS. As discussed earlier this attribute level has had a significant relationship with how barbs were either cut into the core or cut projecting from the core and the degree of tip enlargement or modification involved. All nine tendencies described in Chapter 18 were present in the sample.

Fig. 20.17 Correspondence analysis plot showing relationship between language groups in terms of PWHA-C-HCS attribute state frequencies.
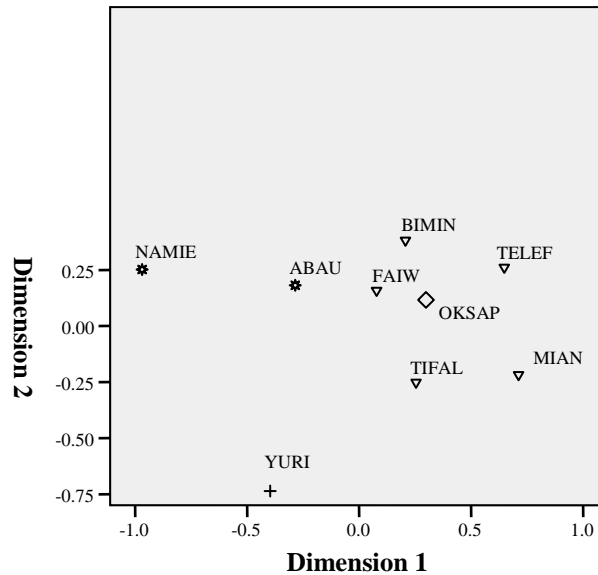
Key: ✳Sepik Family +Language Isolate ▽Mount. Ok Family ◇TNG Phyl. Isolate

The CA plot (Fig. 20.17) reveals a stronger clustering of Mountain Ok groups than does the BBA cross-section, probably because the character of palmwood heads was less impinged by other technology involved with construction. As with many of the string bag attributes, the cluster exhibits some correspondence with social and geographical distance in the relative positions of the Faiwol, Bimin and Oksapmin versus the Tifal, Telefolmin and Mianmin positions. The nearest lowland group, the Abau, is also positioned relatively close to the highland cluster while the two linguistically and socially more remote groups, the Yuri and Namie, are positioned in relative isolation.

There are a number of apparent contributors to this pattern. Firstly, it is common practice within the Mountain Ok area, and not so much elsewhere, to use a teardrop or plano-convex cross-section into which one or two series of barbs are cut respectively along the length of the head. The Namie, on the other hand, demonstrate some tendency to make broader palmwood heads with a two barb series by using rhomboidal cross-sections, again a practice more common to the

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north, as observed in the larger sample. The Yuri sample on the other hand exhibits many arrows that are extremely fine with projecting barbs near the tip and triangular in cross-section, producing three short series of barbs, or teardrop, producing a single short series of barbs. As would be expected in a distance model, and also due to their large and widely distributed population and relatively good sample, the Abau arrow sample exhibits something of all tendencies.

2. PWHA-D-HMOD

The next CA (Fig. 20.18) involved counts for categories belonging to PWHA-D-HMOD. As shown in Chapter 18 there were six tendencies identified for this level and all six have counts in the present sample. Due to an obvious relationship that this level had with the previous level, in that the choice of barbs was likely to determine cross-sections, clustering was also expected to demonstrate a strong relationship to distance. This turned out to be the case and as with PWHA-C-HCS there was a very strong Mountain Ok cluster. Again the lowland/hills groups were positioned away from this cluster with the Yuri well to one side. This time, however, the Abau were somewhat closer to their distant linguistic relatives the Namie and surprisingly more distant than the Namie from the highland cluster, suggesting that this attribute level may have a stronger relationship to language.

Fig. 20.18 Correspondence analysis plot showing relationship between language groups in terms of PWHA-D-HMOD attribute state frequencies.

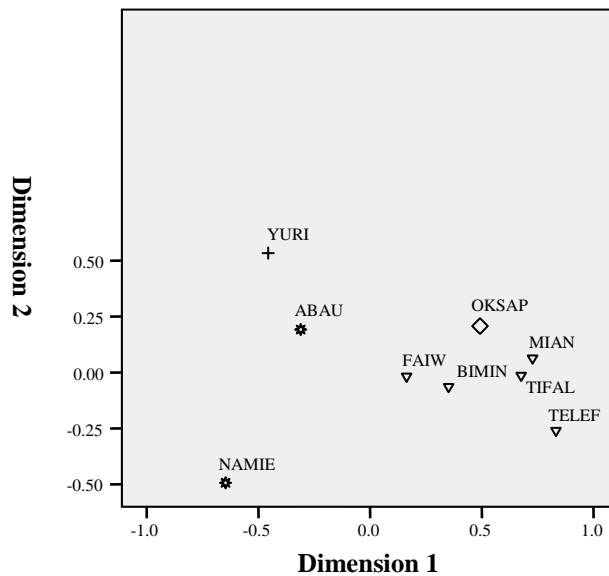Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

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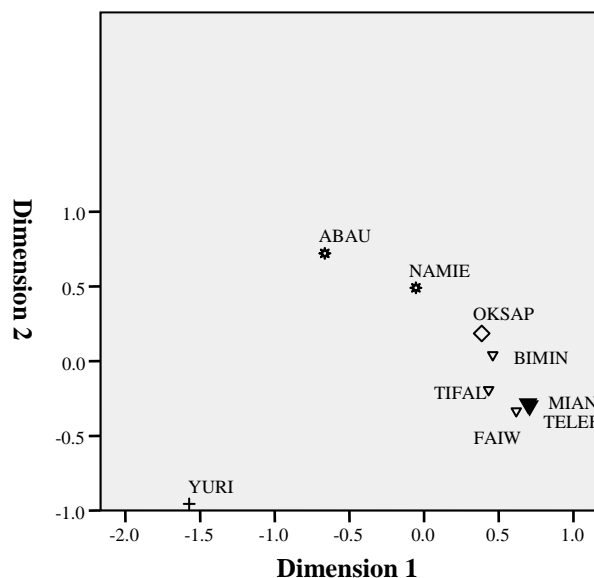
There are several major contributors to this pattern. Firstly, the Abau sample suggests that the Abau are not avid makers of PWHAs with barbs, are less likely to put barbs on arrows more commonly used for game, and if so usually only put one or two simple barbs near the tip. They also seem to prefer to use breakage grooves while most lowland and hills groups are more likely to provide bone-tipped arrows with breakage grooves specifically designed to leave a fragment within the body after arrow removal. They do however show some propensity to provide fight PWHAs with a series of barbs along the tip, a feature that may have been picked up from the Yuri with whom it appears some northern Abau groups were in conflict. The Yuri position, on the other hand, is partially explained by a tendency to barb most PWHAs and they typically do this by using the method just described. The highland groups, however, show homogeneity in the preference for the barbed method mentioned previously and tend to barb most arrows, although the Tifal and Oksapmin, exhibit a smaller ratio of barbed PWHAs to non-barbed.

3. PWHA/BTA-E-STMCRCS

Prior to the presentation of the CA analyses and interpretations of the BTAs, it would be best to provide a statistic for PWHA and BTA head core cross-sections (PWHA/BTA-E-STMCRCS), the combined samples number 840. The CA plot (Fig. 20.19) demonstrates a good reflection of the languages relative positions in geographical space, indeed one greater than that for PWHA-D-HMOD. It is very likely that the cross-section of the stem core is less functionally determined that the cross-section of the barbed section or modified tip. Therefore, being more susceptible to discrete differences in local preferences in technique, it is more sensitive to distance.

The result is that the Mountain Ok groups have clustered more tightly with their relative positions in the east and west of CNG well reflected. The Abau are the lowland group closest to the highlands groups, in line with the groups' geographical positions. Likewise, the Yuri are positioned nearest to the Abau with the other lowland group, the relatively geographically and socially remote Namie, positioned some distance from the rest.

Fig. 20.19 Correspondence analysis plot showing relationship between language groups in terms of PWHA/BTA-E-STMCRCS attribute state frequencies.

Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

As far as PWHA structure and the manner in which the head is attached to the shaft are concerned, these were analogous for the present sample and this is also true for BTAs. All arrows include the shaft and single palmwood head component and heads were always slotted into the shafts' culm pith cavities. Therefore there were no analyses for PWHA/BTA-E-HATT.

20.4.1.3 Bone tipped arrows (BTA)

The BTA sample included 256 examples. Only four groups in the quantified sample possessed BTAs and although they are ubiquitous across the Border Mountains and lowlands for the study area, the Mianmin were the only CNG group that had them. The Mianmin's possession of this arrow class is probably due to their encroachment into the lowland periphery and the resulting contact/conflict with Abau, Amto, Left May and Iwam speakers who also use such arrows (Craig 1968a). Scrutiny of the arrows suggests that the adoption of this subclass has been relatively recent, for the Mianmin specimens are comparatively crudely crafted, the bone-tips vary greatly in size and the incised designs are imperfectly copied (c. f. Bettinger & Eerkins 1999).

For the Sepik Family languages Abau and Namie, the subclass was an important fight arrow, while for the Yuri the subclass appears to be less common, probably due to the preeminence of their patently lethal, fine barbed tipped PWHAs. Analyses on bone-tips were not carried out because of the significant number missing from their arrows.

Three attribute levels were chosen for this class: cross-sections of the delivery end of the head prior to the juncture with the bone-tip (BTA-C-HCS); for BTA head modification (BTA-D-HMOD); and BTA head core cross-sections (PWHA/BTA-D-STMCRS) which was carried out in the preceding CA.

1. BTA-C-HCS

The first CA for BTAs (Fig. 20.20) involved (BTA-C-HCS). Again this had some relationship with how the head was modified with barbing although BTAs were less likely to be barbed than other fight arrows. The sample exhibited all cross-section tendencies apart from meniscoid which is understandable as this cross-section is a tendency associated with more bladelike PWHAs.

The plot reveals a strong affinity to the manner in which the languages are situated geographically, with the Abau in the centre and the other languages equidistant as they are in actual space.

Fig. 20.20 Correspondence analysis plot showing relationship between language groups in terms of BTA-C-HCS attribute state frequencies.

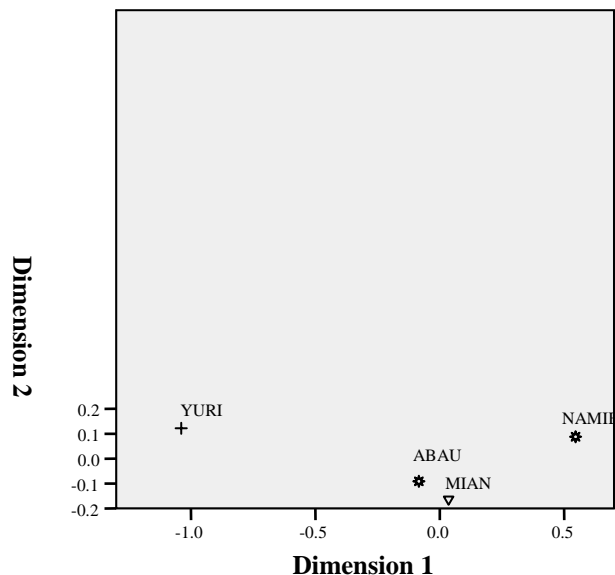Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family
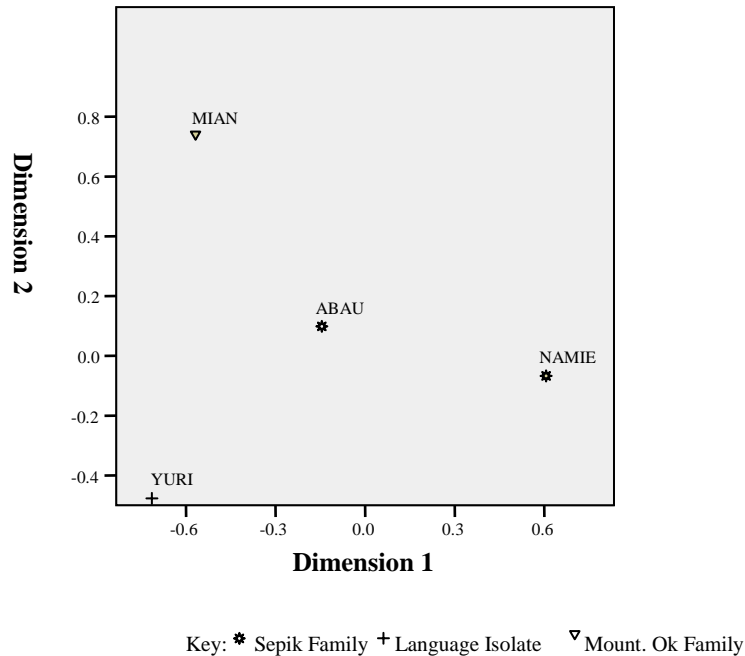
The contributing factors to this distribution appear to be relative preferences for round and other cross-sectional tendencies. Firstly, the Yuri tend to use an oval cross-section which is not particularly useful for applying breakage grooves (HMOD 5). Instead of breakage grooves the Yuri rely on the action of a heavier and thicker point penetrating deep into the body enabling the bone tip to be more securely implanted. This also enables them to apply bold incised designs along the head. On the other hand the other groups tend to use finer heads with an even diameter which better enables the provision of breakage grooves and greater ease of breakage; although the bone tip may not penetrate as far, the need to remove the head fragment compounded the injuries sustained while leaving the bone tip inside the body. The differences between the groups that prefer these finer tips are whether they prefer square or triangular tendencies. The Mianmin mainly differ from the Abau and Namie because their sample includes plano-convex cross-sections in line with their Mountain Ok heritage and the fact they are still coming to terms with assimilating the class into their repertoire.

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2. BTA-D-HMOD

The next CA involved BTA-D-HMOD (Fig. 20.21). The BTA sample included fewer HMOD tendencies to PWHAs, which should be of no surprise as the main concern of the weapon was to leave the bone tip inside the victim's body; only HMOD 1, 4, 5, 6 were present. It was also clear that many of the BTAs with more pronounced head modification were originally PWHAs; this was apparent in that the tip had been refashioned and tapered more abruptly.

The plot reveals a similar positioning of the languages accurately reflecting their relative positions in space, although the Abau and Mianmin are a little closer due to a similar ratio in their preferences between barbed, non-barbed and breakage groove arrows. As stylistic similarities between some Mianmin and Abau BTA arrows are very apparent, we can assume that such preferences are due to contiguity at the western and southwestern end of Abau territory.

Fig. 20.21 Correspondence analysis plot showing relationship between language groups in terms of BTA-D-HMOD attribute state frequencies.

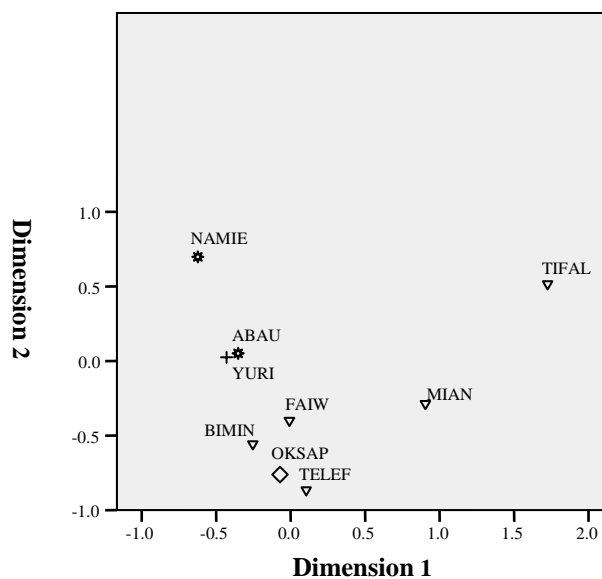Key: ✱ Sepik Family ✛ Language Isolate ▽ Mount. Ok Family

20.4.1.4 Bindings (BIND)

As was outlined in Chapter 18, the bindings will be considered according to position and function on the arrow, not according to which arrow class they belong, as some bind positions (attribute levels) transcend class while others are exclusive to particular classes. There were twelve varieties of bind involving either whipping, knotting or braiding identified for the study area and all were present in this sample. There are five binding positions, BIND-A/B/C/D/E, and these complete the attribute levels for the arrow analyses. Further analyses involving the arrows' decorative attributes will be undertaken in near future.

1. BIND-A

The first CA for binds was for those which secured the shaft to the inserted foreshaft/head (BIND-A). This position provides the largest count (N=1234) for all arrow analyses as this juncture is necessary for all BTAs and PWHAs and foreshafted BBAs. Whipping, knotting or braiding were used for this position and eight of the twelve tendencies were present at this position in the sample.

Fig. 20.22 Correspondence analysis plot showing relationship between language groups in terms of BIND-A attribute state frequencies.

Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

The CA plot (Fig. 20.22) again suggests a strong distance factor responsible for distribution with some separation between clusters of highland and lowland groups. The highlands groups are strongly clustered and include the phylum isolate Oksapmin, but interestingly the Tifal are isolated and the Mianmin less so.

The key factors for this plot involve two tiers of difference. Firstly, the lowland groups tend to use whipping and knotting in greater proportion to braiding. Secondly there is a considerably variety of braiding methods used. The Tifal, and to a lesser degree the Mianmin, show a propensity to use a simple Braid 1 while all other groups show a tendency to use Braid 2.

The other braid of significance at this level (Braid 4) is used almost exclusively by the Abau, Mianmin and Telefol which geographically forms a neat and continuous transect north from the inter-montane valley to the banks of Sepik in the lowland plains but it is hard to explain this distribution with any existing social data although a variant of Braid 4 is important to upper level binding in the NFC which makes the exclusion of the Oksapmin here surprising. The use of the Braid 1 by the Tifal reflects a common tendency for the use of this braid in western CNG, observed in the larger sample, and attests to the strong cultural and social affinities that the Tifal have with the Ngalum and Kauwol populations, although the degree to which it occurs for the Mianmin is curious.

2. BIND-B

The second CA (Fig. 20.23) involves binds that were placed near the juncture between shaft and head/foreshaft (BIND-B) and may be a conflation of a buffering device and a decorative device derived from a buffering antecedent, although a few did exhibit remnants of feathers and therefore some were undoubtedly used for this purpose as well. As discussed in the previous chapter, this bind was uncommon for BBAs and the sample of 431 with the bind included 16 BBAs, 235 PWHA and 180 BTAs.

Fig. 20.23 Correspondence analysis plot showing relationship between language groups in terms of BIND-B attribute state frequencies.
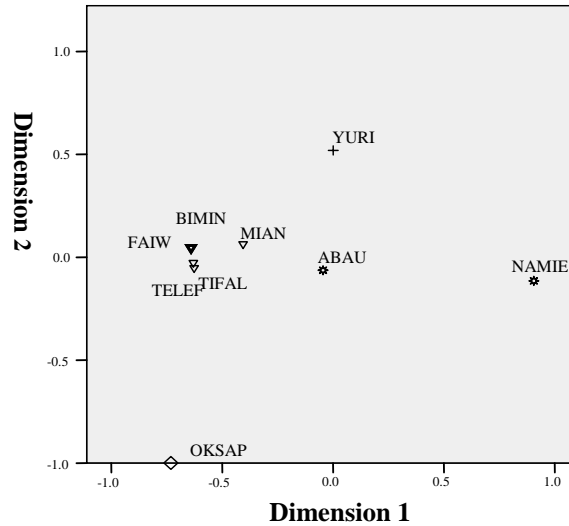
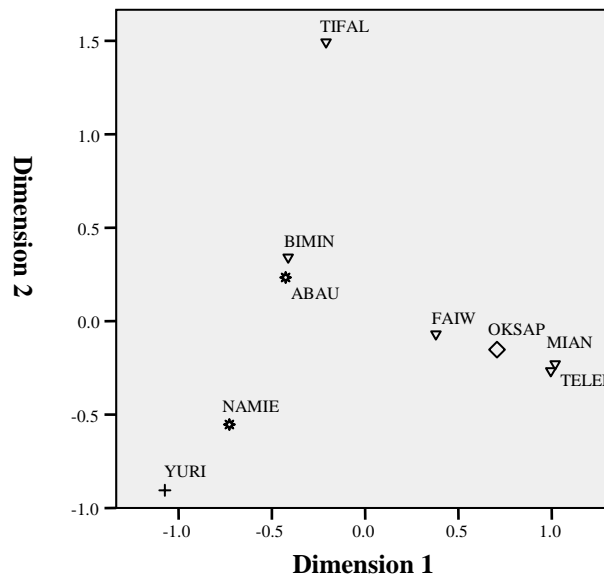Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

The plot for this particular attribute level is striking for although it still exhibits a strong correlation with distance, language affinity is also evident in the plot beyond the degree to which languages are positioned in relative space. Again the lowland/BM populations show a strong use of whipping and knotting while the highlanders tend towards braids, although yet again the Mianmin exhibit lowland tendencies in that they too use Knot 1 for this position.

3. BIND-C

The third CA for binds (Fig. 20.24) involved those that secured the end of the blade stem to the shaft/foreshaft or what seemed to be a derivative used at a similar position on barbed or enlarged tipped PWHAs (BIND-C). The sample included 406 binds. The plot exhibits again a strong correlation with distance with the reemergence of the NFC and a definite division between lowland/hills and highland groups. The Tifal are again isolated in line with their relative social and cultural dislocation from western CNG. The Bimin position again is probably influenced by the fact that the majority of arrows were from the Kwermin and if there was a larger Bimin-Kuskusmin sample, one would expect some convergence with NFC groups.

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It is clear that apart from the influence of the NFC and the isolation of the Tifal that this plot also shows some correlation with language, especially the position of the lowland groups, and at this point the language isolate Yuri diverge from the rest.

Fig. 20.24 Correspondence analysis plot showing relationship between language groups in terms of BIND-C attribute state frequencies.


There are a number of key factors for this plot. Firstly, we see the introduction of Knot 2. This particular knotting technique is almost exclusively used in this position and by the NFC groups. In the larger sample for the study area, this knotting technique is otherwise evident only in the far north in the foothills of the Bewani Mountains where the Fas language is spoken. Knot 1 however is both exclusively and commonly used in the lowlands/hills especially amongst the Yuri. Braids 2 and 4 are also important at this position and what is notable is that the use of Braid 2 is concentrated within the Abau speaking region whereas the use of Braid 4 is concentrated with the Telefolmin.

4. BIND-D

The fourth CA for binds (Fig. 20.25) involves those that secure the blade proper to the shaft/foreshaft and consequently the sample only involves BBAs (BIND-D).

Forty-five BBAs had lost their binds so the sample was 504. As was pointed out in the previous chapter, the typically meniscoidal and tapering nature of this juncture meant that whipping came to the fore as a binding method here whereas it had played not such an important role previously. Whipping method 5 first appears at this point and is especially ubiquitous; it appears to be best for arrows with particularly wide meniscoidal junctures.

Fig. 20.25 Correspondence analysis plot showing relationship between language groups in terms of BIND-D attribute state frequencies.

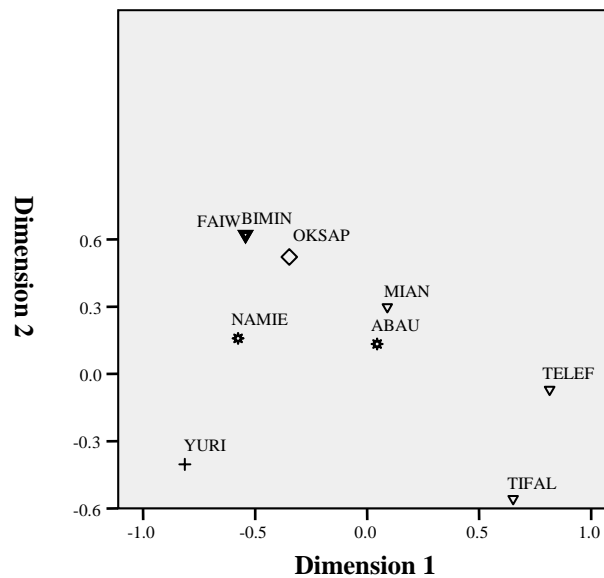Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate
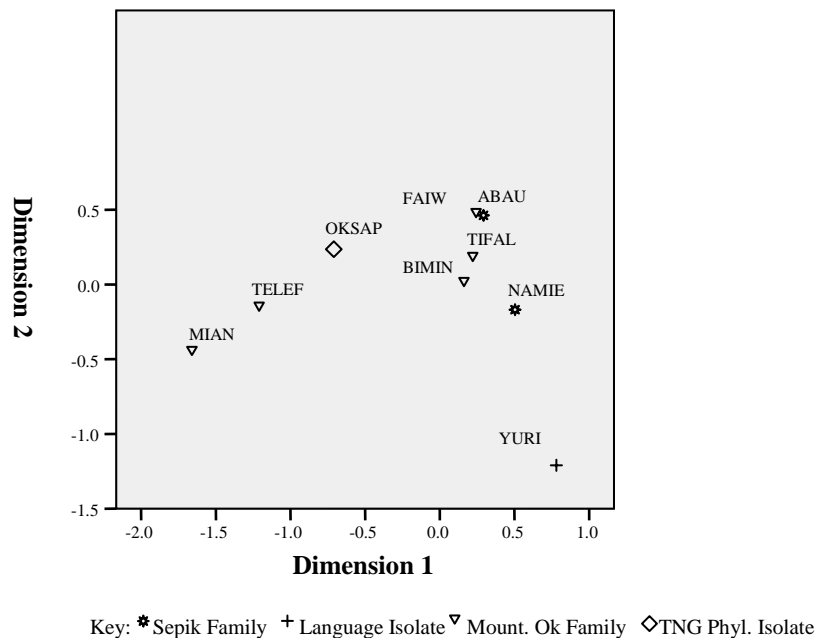
Expectedly, the CA plot shows an increasing convergence of NFC groups, with the other Mountain Ok languages converging with the lowlands languages, although the Yuri become further isolated. The nature of this plot is not surprising considering much of the clustering has to do with the way the blade is attached to the shaft/foreshaft. The key factors are, firstly the NFC groups' use of braids, especially Braid 4, because of the notched foreshaft juncture's more circular cross-section whereas the use of braids elsewhere is almost nonexistent. Also important here is the Mianmin's and Telefolmin's common choice of braid and even the looped band for this juncture. The other NFC group, the Oksapmin, show a

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preference for Braid 2 and do not use the looped band in this manner. The Yuri, on the other hand, exhibit a preference for Whip 3, an uncommon bind elsewhere.

5. BIND-E

The fifth and final attribute level for binds, and indeed for the sequence of nominal arrow data analysis, involves those that secure such things as feathers and pig bristles at the top of the shaft/foreshaft to blade juncture (BIND-E); again the sample only includes BBAs and numbered 336. This position only involves whipping and, as discussed previously, it is here that the craft of women comes into play as the string and looped bands that are traditionally used for these binds are made by women. The use of red cloth in parts of the Border Mountains had become common prior to the collecting of the sample, a feature likely to have been inspired and provisioned by Dutch trade cloth. The whipping used is always a simple plain wind using string made by women (Whip 1).

Fig. 20.26 Correspondence analysis plot showing relationship between language groups in terms of BIND-E attribute state frequencies.

Key: ✳ Sepik Family + Language Isolate ▽ Mount. Ok Family ◇ TNG Phyl. Isolate

The CA plot (Fig. 20.26) demonstrates patterns that could be argued to be equally determined by language and distance and well as other factors. The linguistically

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and geographically close, but socially distant, Tifal and Telefol speakers are isolated over on the right hand side of the plot. While the linguistically close Faiwol and Bimin speakers are over to the left close to the Oksapmin to form that familiar cluster. The Mianmin, who are more socially isolated and marginally more linguistically remote from surrounding Mountain Ok speakers, are situated between these clusters but relatively close to their lowland neighbours the Abau, while the Namie, and even more so the Yuri, have become remote on the left hand side of the plot. The crucial determinant of this plot is the proportionate use of string to string bands. In the central CNG core, the use of bands appears to be greatest and then wanes as one moves north through the contiguous languages on that transect north to the banks of the Sepik in the lowland plains; everywhere else the use of bands is minimal or non-existent. Apart from the common use of bands by the Tifal, the pattern follows that of the use of B4 at BIND-E level. The second determinant is the use of red rag by the Yuri who, as mentioned previously, had significant contact with the Dutch prior to the establishment of regular Australian patrols in the late 1950s. Rag is only moderately used by the other lowland groups and by Tifal speakers, near the August River, and includes blue material and even dyed red thread, suggesting at least another source.

20.4.2 Arrows: metric data and ANOVA

<u>BBA</u>

The arrow samples were also subjected to ANOVA. This time the metric data consisted of lengths for arrow blades (BBA-A-BLDLGTH) and whole arrows (BBA-B-WHLGTH). The first arrow subclass to be explored was BBA of which there was a sample of 523 complete arrows and an additional four blades without their shafts; arrows without blades were not included in the tests. A scattergram of blade to whole lengths (Fig. 20.27) revealed that there were two clusters and linear tendencies. Interestingly, arrows from the three arrow structures were relatively evenly distributed in both clusters although it is apparent that STRCT 1 tends towards the end of the scale.

Fig. 20.27 Scattergram for BBA-B-WHLGTH to BBA-A-BLDLGTH (n=523).
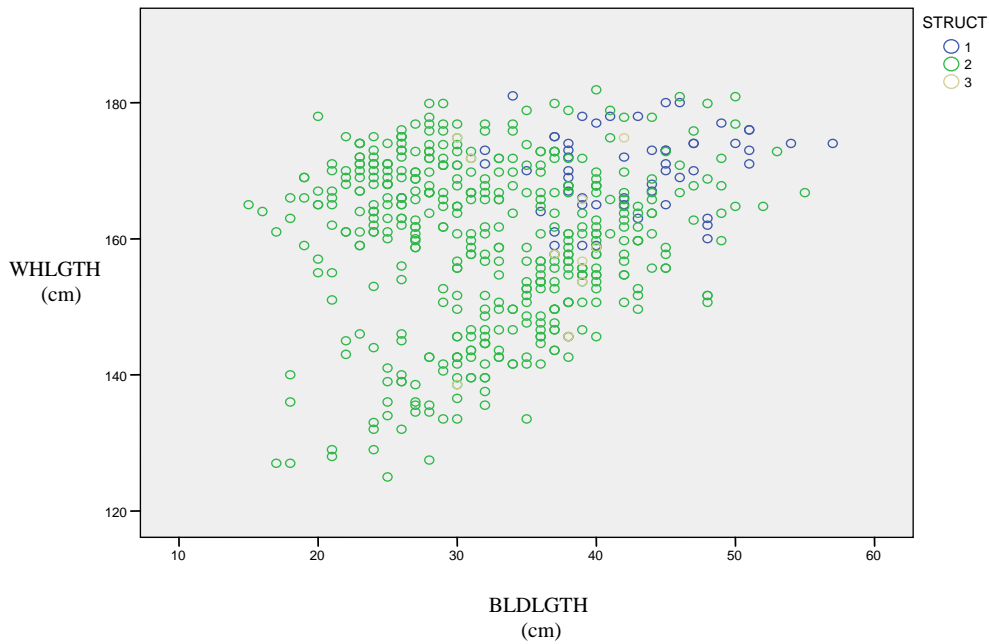
Boxplots for blade lengths and whole lengths categorized according to structure (Figs 20.28 and 20.29) revealed that there were quite significant ranges in length for both arrow blades and whole lengths for all structure classes. This is especially so for STRCT 2 arrows, which is not surprising considering that this category includes the largest sample. There was also some overlap between the range of lengths, although the mean for STRCT 1 at 170.50 was approximately ten centimeters longer than that for STRCT 2 and STRCT 3 at 159.61 and 160.91 respectively, in agreement with the assumption that the additional weight provided by the foreshaft allowed for a shorter arrow.

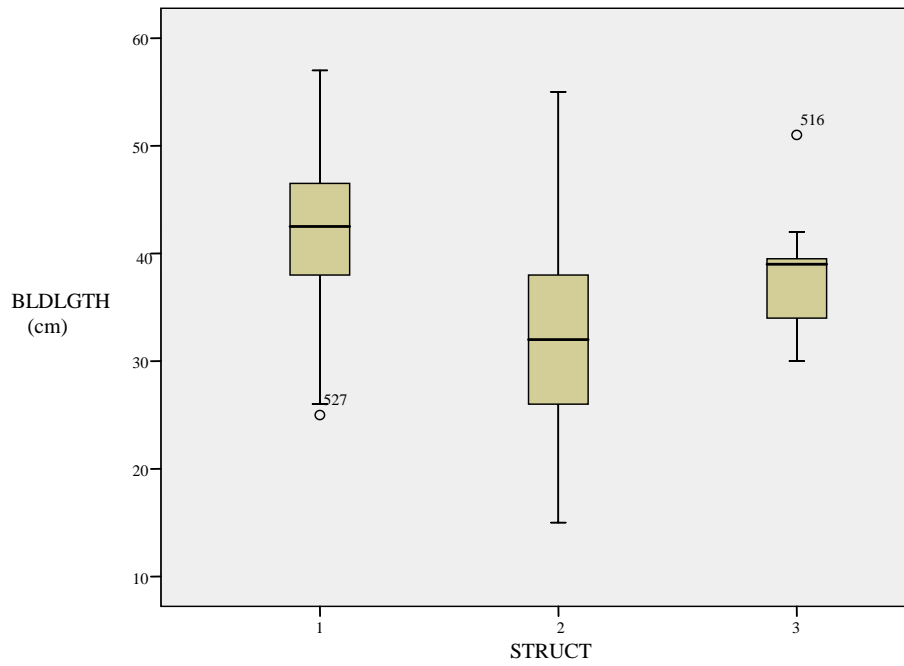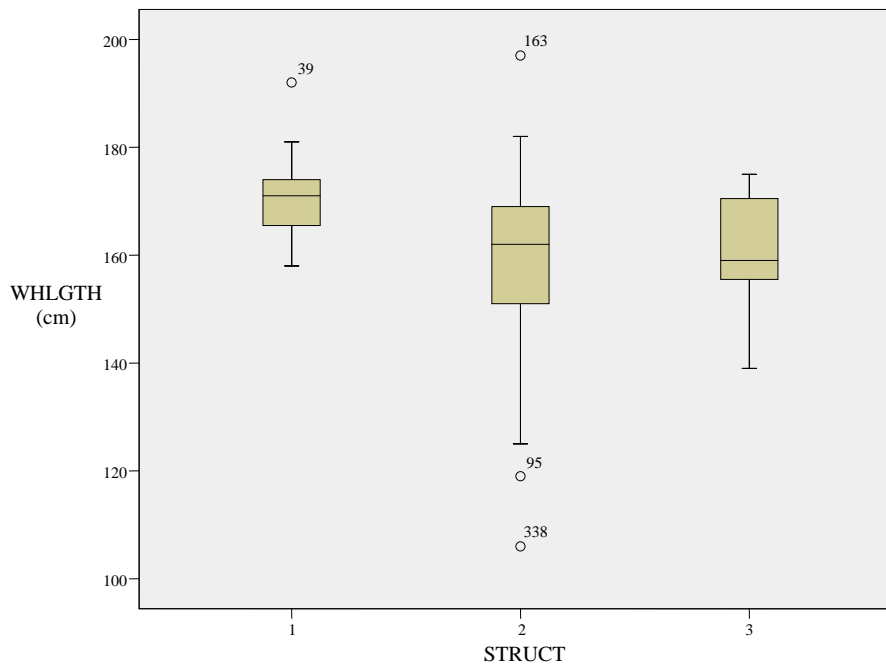Fig. 20.28 Boxplot for BBA-A-BLDLGTH variance according to BBA-C-STRCT (n=523).

Fig. 20.29 Boxplot for BBA-B-WHLGTH variance according to BBA-C-STRCT (n=523).

Blade lengths reflected the pattern for whole length somewhat in that the mean length for blades was greater for STRCT 1 although STRCT 3 blade length was somewhat greater than for STRCT 2, although this may be due partially to sample size.

Six outliers evident in the boxplots were removed from the sample leaving a total of 521 (Appendices 31a and b). Again the complete sample did not demonstrate a normal distribution for either whole or blade length. As the BBA sample was far greater than those used in the string bag ANOVAs, it was considered that the test would be more resistant to any violations of the assumption of normality. Interestingly, WHLGTH and BLDLGTH for STRCT 1 and STRCT 3 did pass both Kolmogorov-Smirnov and Shapiro-Wilks tests.

ANOVAs involved BBA whole lengths and blade lengths. The *p*-value for the Levene Test this time indicated that the whole length sample satisfied the assumption of homogeneity of variance across groups although the blade length sample did not. Results for *F*-tests for both blade length and whole length and language gave a p-value < .001, well below the α-level, again suggesting the rejection of the null hypothesis that there is no significant difference between the groups' means. Importantly η^2 for the dependent variables were significantly different: BBA-BLDLGTH and language had an effect size of 0.165 while η^2 for whole length and language was very significant at 0.70.

A review of the post hoc tests indicated that while there may be significant differences between language means for blade length, comparisons of the means demonstrate little evidence that distance or language affinity had any relationship with the length of those differences (Table 20.5).

Table 20.5 Homogeneous subsets of languages with related means for
BBA-A-BLDLGTH, α = 0.1.

Tukey HSD

	n	1	2	3
TIFAL	47	28.32		
BIMIN	8	28.63	28.63	
YURI	68	29.99	29.99	29.99
OKSAP	17	31.41	31.41	31.41
ABAU	211	32.77	32.77	32.77
FAIW	5	33.80	33.80	33.80
NAMIE	57	37.04	37.04	37.04
TELEF	73		37.25	37.25
MIAN	35			38.71
Sig.		.011	.012	.011

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 18.581.
b The group sizes are unequal. The harmonic mean of the group sizes is used.
Type I error levels are not guaranteed.

On the other hand, comparisons of language means for whole length indicated that
both language affinity and distance had a significant relationship with differences in
means (Table 20.6). Subsets reflecting south-east and centre/north-west clusters
apparent in prior levels of analyses were apparent, although this time the Tifal were
closer to members of the south-east cluster, and the lowland groups formed another
subset. Crucially, this time the Sepik languages, Abau and Namie, were closer to each
other than to any other language.

Table 20.6 Homogeneous subsets of languages with related means for BBA-B-WHLGTH,
α = 0.1.

Tukey HSD

	n	1	2	3	4	5
BIMIN	8	137.38				
OKSAP	17	140.88	140.88			
TIFAL	46	141.63	141.63			
FAIW	5		147.80	147.80		
TELEF	73			152.74	152.74	
MIAN	35				156.89	
NAMIE	56					164.89
ABAU	211					166.56
YURI	66					172.64
Sig.		.575	.041	.362	.610	.012

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 18.535.
b The group sizes are unequal. The harmonic mean of the group sizes is used.
Type I error levels are not guaranteed.

BTA

The next round of tests concerned BTAs. BTAs are a class of arrow invariably made for fighting and therefore uniformity of function meant that variation in length had arguably a greater potential for diagnosis of the impact of social and cultural distance. The scattergram for the sample of 256 (Fig. 20.30) indicated a relatively linear tendency in the relationship between head length and whole length which is conceivably in large part due to the fact that there is only one structure for the class whereby small bone tips are slotted onto the ends of the arrows' heads.

Boxplots (Figs. 20.31 and 20.32) reveal that there were several outliers but that there was not a significant degree of difference in variance across groups for the two dependents. Ten outliers were then removed leaving a sample of 246 for which normality tests were undertaken.

Fig. 20.30 Scattergram for BTA-B-WHLGTH to BTA-A- HDLGTH (n=256).
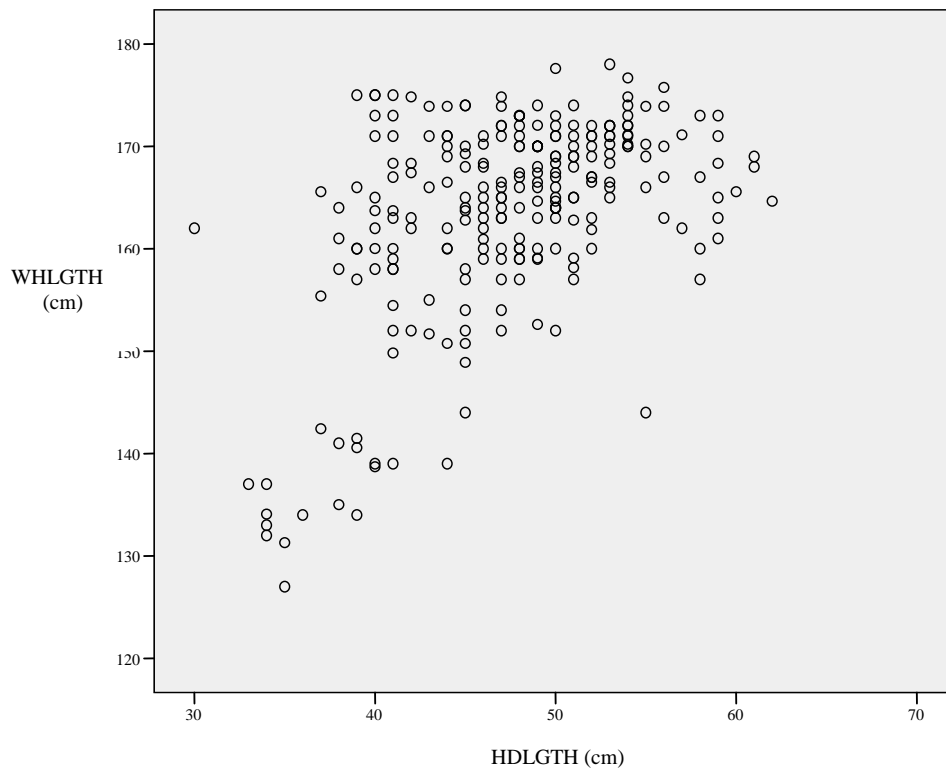

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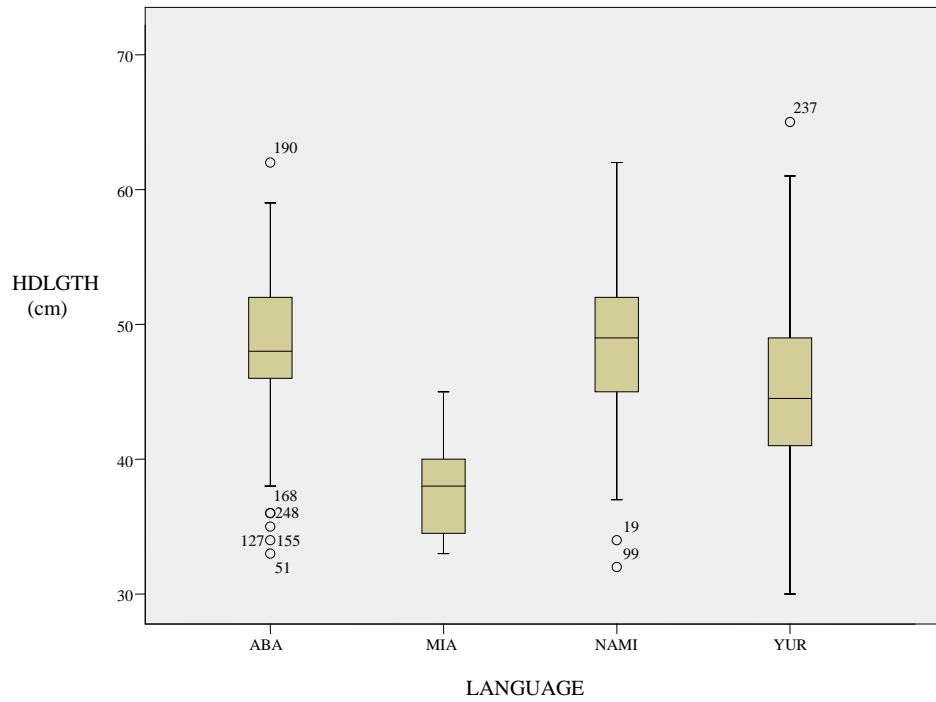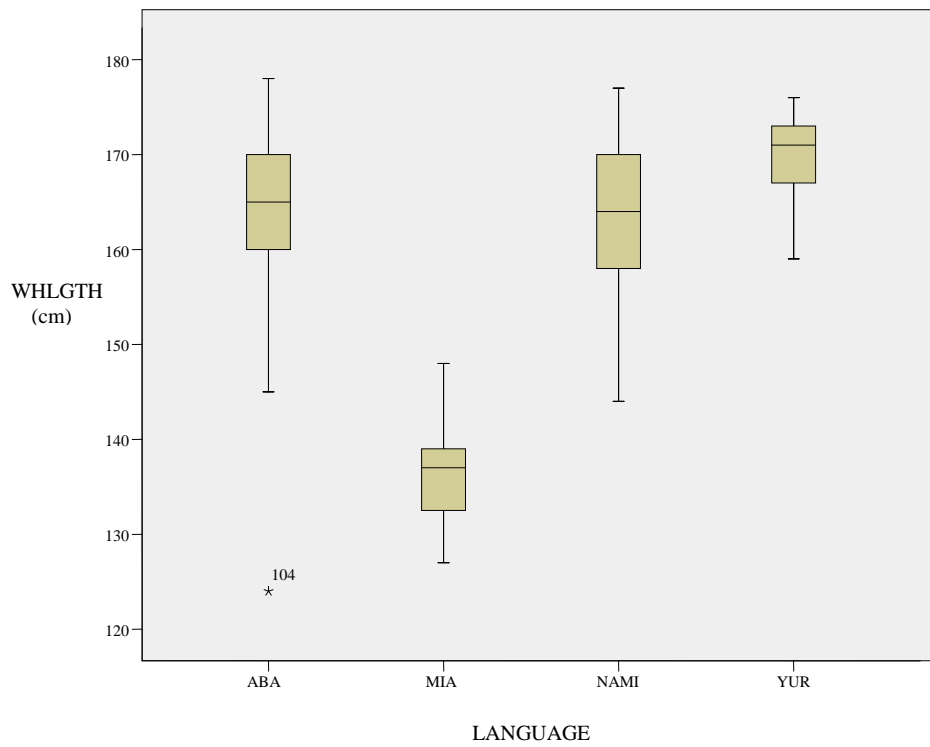Fig. 20.31 Boxplot for BTA-A-HDLGTH variance according to language (n=256).

Fig. 20.32 Boxplot for BTA-B-WHLGTH variance according to language (n=256).

Kolmogorov-Smirnov and Shapiro-Wilk tests revealed that whole length did not demonstrate a normal distribution and there was considerable skewness and kurtosis. Head length on the other hand exhibited a more normal distribution and also scored a p-value of 0.180 for the Shapiro-Wilk test.

As with BBAs, the BTA sample was subjected to ANOVAs for both whole and head length. Interestingly, Levene tests indicated no violation of homogeneity of variance for head length but did for whole length. Due to violations of normality and homogeneity of variance, whole length was also subjected to an ANOVA with an α-level of .01 (Sheskin 2004: 707). The subsequent F-test indicated a significant difference between the groups' means and a substantial η^2 of 0.65.

As with BBA blade length, a slightly less significant result was obtained for BTA head length compared with whole length. The F-test demonstrated a significant difference between the groups' means but the η^2 was smaller at 0.25. Nevertheless as would be expected, unlike BBA blade lengths, which were more likely to be affected by discrete differences in function, post hoc tests for BTA head length demonstrated a possible relationship with language but not one with distance (Table 20.7).

Table 20.7 Homogeneous subsets of languages with related means for BTA-A-HDLGTH, $\alpha = 0.1$.

Tukey HSD

	n	1	2
MIAN	20	38.00	
YURI	39		45.49
NAMIE	89		48.43
ABAU	98		49.10
Sig.		1.000	.011

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 41.203.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Post hoc tests also indicated a possible relationship between BTA-B-WHLGTH means and language (Table 20.8).

Table 20.8 Homogeneous subsets of languages with related means
 for BTA-B-WHLGTH, α = 0.1.

Tukey HSD

	n	1	2	3
MIAN	20	136.05		
NAMIE	89		163.53	
ABAU	98		165.48	165.48
YURI	39			169.67
Sig.		1.000	.470	.011

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 41.203.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

PWHA

The final round of tests concerned the PWHA and, as this class arguably includes a greater number of functional subclasses than either BBAs or BTAs, patterns due to variance in lengths were potentially going to be greater in number and more difficult to interpret. The sample included 584 individuals ten of these being heads without the shafts.

Fig. 20.33 Scattergram for PWHA-B-WHLGTH to PWHA-A-HDLGTH (n=574)
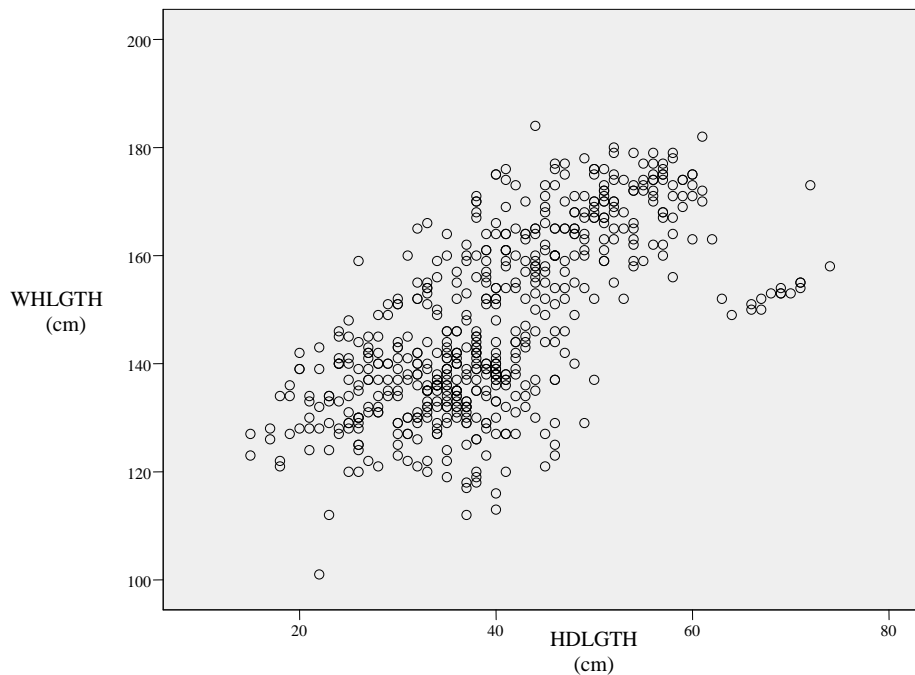
The scattergram for PWHA-A-HDLGTH to PWHA-B-WHLGTH (Fig. 20.33) indicated stronger linearity for PWHAs than for BBAs and BTAs, although the relationship between the values of both dependents was numerically similar to that for BTAs. A small cluster of scores demonstrating its own linearity is evident on the right hand side of the scattergram indicative of membership to a particular tendency shared by a set of arrow makers. On inspection of the ID numbers it became apparent that arrows belonging to this cluster came from a single Abau settlement, Isu, at the juncture of the August River and Sepik rivers.

Boxplots for the two dependents and language (Figs. 20.34 and 20.35) revealed several outliers and some inequality in the range of variance, most notably the Yuri sample in whole length, which at 64 is below the sample mean of 65. This variance is quite surprising.

Fig. 20.34 Boxplot for PWHA-B-HDLGTH variance according to language (n=584)
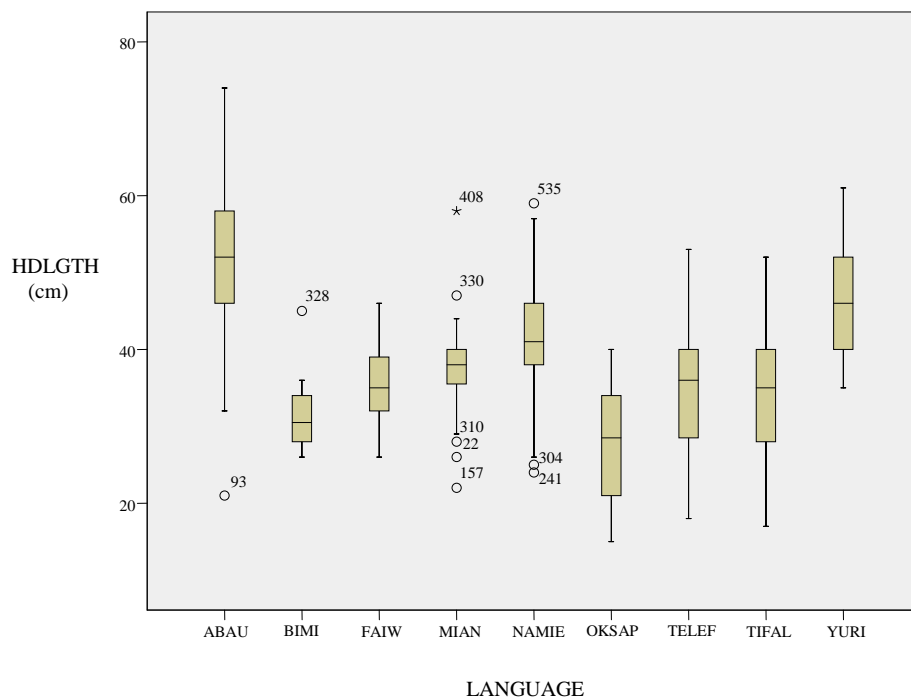
Outliers were removed leaving a sample of 561 for whole length and 574 for head length. Normality tests revealed that whole length and head length both violated the assumption of normality, but in both cases skewness and kurtosis were not extreme although whole length exhibited a bimodal distribution.

ANOVA tests were again undertaken for both whole and head length with α-levels sets at .01. Similar results were obtained for both dependents with significant F-tests and n² values of .60 and .56 for WHLGTH and HDLGTH respectively. A review of the homogeneous subsets (Tables 20.9 and 20.10) again reiterates patterns shown by other classes and unequivocally affirms the rigorousness of ANOVA even where there has been quite significant violation of assumptions.

Fig. 20.35 Boxplot for PWHA-B-WHLGTH variance according to language (n=574)
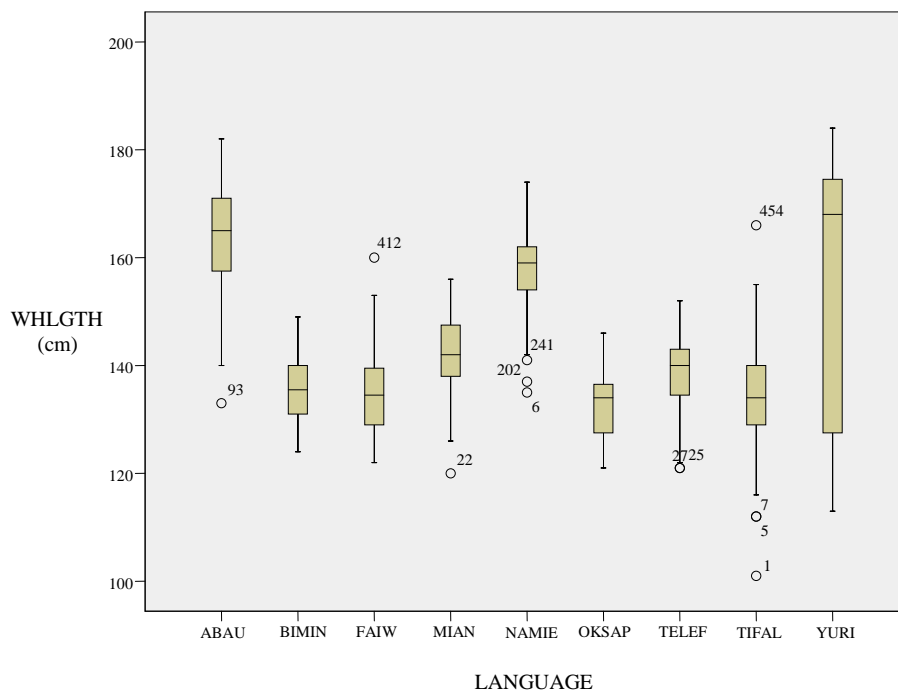
Table 20.9 Homogeneous subsets of languages with related means for
  PWHA-A-HDLGTH and language, α = 0.1

Tukey HSD

	n	1	2	3	4	5	6
OKSAP	42	27.50					
BIMIN	17	30.65	30.65				
TIFAL	103		33.91	33.91			
TELEF	95		34.28	34.28			
FAIW	28		35.46	35.46			
MIAN	35			37.63	37.63		
NAMIE	76				42.14	42.14	
YURI	64					46.55	
ABAU	114						52.69
Sig.		.501	.044	.268	.078	.095	1.000

Means for groups in homogeneous subsets are displayed.
 a Uses Harmonic Mean Sample Size = 43.965.
 b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 20.10 Homogeneous subsets of languages with related means for PWHA-B-
  WHLGTH, α = 0.1

Tukey B

	n	1	2	3	4
OKSAP	39	132.51			
TIFAL	92	134.42			
FAIW	27	134.56			
BIMIN	18	135.50	135.50		
TELEF	93	138.98	138.98		
MIAN	38		142.50		
YURI	64			156.98	
NAMIE	76			159.25	159.25
ABAU	114				164.57

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 44.177.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The persistence of the south-east and centre/north-west clusters, albeit with an occasional realignment of one group with one cluster or the other cluster, is striking. Again the lowland groups cluster, either according to distance or language, and remain at the extreme end of the scale with means consistently greater than the highland neighbours.

20.5 Conclusion for analyses

The ANOVA and CA plot for both string bags and arrows demonstrate that there is a significant relationship between distance and the patterning of the attribute levels and it is evident that south-east and centre/north-west highland clusters, and a lowland cluster, are salient features of both the CA and ANOVA tests. For *string bags* this pattern is accentuated by more discrete clustering and this is likely to be attributable to the fact that women's culture best reflects the status of social relationships between contiguous groups; a fact that is somewhat backed by observations of inter-group relations in the ethnographic record. For *arrows* intra-highland clusters are not so evident and the attribute levels exhibit a little more variability in the way that languages position in relation to each other, reflecting more general spatial relationships. Considering arguments put forward earlier in this thesis, these patterns are to be expected due to the fact that men are more likely to travel a community or two beyond those that are contiguous, while women are more likely to restrict their movement to that between two contiguous communities.

It also seems that the enmity that had existed just prior to the time the collections were made had little effect on these patterns, reflecting the likelihood that conflict did not fully inhibit relations between communities and that it was rarely protracted. Although, as was the case with the Tifal and Telefol speakers, not all groups speaking a particular language were at odds with all the groups of another language. And, as with the Telefolmin and Feranmin, there was some enmity between groups speaking the same language.

One of the most interesting exceptions in this regard is in fact one in which enmity may have encouraged the spread of culture: that is, the distribution of the NFC across three contiguous language groups who shared a great deal of enmity towards each other and appear not to have engaged in any direct exchange whatsoever. It is likely that it was interest in and access to each other's weapons arsenal that contributed to this affinity; although the adoption of this technology would have likely taken several generations and enmity may have been absent in some periods during the time this technology spread. Even so, the NFC distribution is a likely example of the way in which warfare contributes to the spread of culture without an associated displacement and movement of personnel.

While there is a strong signal for the effect of distance across the various tests there appear to be few that exhibit an effect that could be confidently linked to language affinity. The first of these was PWHA-D-HMOD for which related languages cluster in both the highlands and lowlands without any significant intra-family positioning reflecting distance. As the most complex attribute of the PWHA head in terms of crafting, this makes sense. Another, BIND-B, also exhibits some possible effect especially in the highlands where both intra-family and inter-family/language relationships strongly reflect language. There are two possible reasons for this. First, it is one of two bind positions that transcend the NFC and non-NFC traditions and therefore the distribution of attribute states would not have been disrupted by the introduction of that technology. Secondly, unlike BIND-A, BIND-B is almost always a braid, especially when it occurs in the highlands, and therefore more likely to involve a more complex binding technique than BIND-A, which is more often replaced and consequently more often whipped.

Finally, arrow whole lengths seem to exhibit some language effect especially in the lowlands but this may reflect a strong correspondence between language and ecology and subsistence systems. The most fundamental expression of this is in terms of the relationship between altitude and arrow length/arrow head weighting in the form of BTA/PWHA-B-HDLGTH: high altitude groups invariably have the shortest and less weighted arrows, the lowland and hills groups have the heaviest and longest, and the mid-altitude fringe Mianmin having mean lengths and weights between those two. Highland populations in New Guinea are commonly shorter in stature than those in the lowlands largely due to dietary deficiencies, the most important of which has to do with protein intake (Dennett and Connell 1988: 275). This, coupled with the fact that people of the lowlands tropics tend to have longer limbs to facilitate better regulation of body heat, would sufficiently account for this pattern (Eveleth & Tanner 1976: 271). What is clear from the data is that the sweet potato-dominant groups (SBST 4 and 5) appear to be most affected, suggesting that the greatest proportion of sweet potato uptake has not resulted in a channeling of surplus to pig production but occurred as an adjustment to environmental degradation. Note that the Tifal are third highest in this tendency. As I pointed out in Chapter 4, the ethnographic evidence suggests that the Atbalmin, a large Tifal

speaking population, was tending towards SBST 5. The data confirm such observations. They also suggest that the less horticulture-intense sago exploiting societies (SBST 1 and 2) are the best nourished, with SBST 2 possibly having the edge on SBST 1 if we consider the position of the Yuri in relation to the Namie and Abau in terms of overall arrow whole sizes.

As far as the string bags are concerned, in terms of language, the most intriguing attribute level is SB-C-STRCT which concerns how a bag was started and constructed. This level appears to be one of the most likely signals for language as much of the relative positioning distance corresponds with language affinity. This is consistent with Pryor and Carr's (1995: 262; 276) findings that more fundamental and less visible technological features are more likely to reflect close social relationships.

21. Conclusion and further directions in research

Three objectives have underpinned this study. Firstly, I have sought to construct a system that enables the extraction of analytical units from a material culture dataset to explore the relationships between material culture, on the one hand, and language and distance on the other. Secondly, in doing so, I have attempted to demonstrate that different material culture attributes are likely to be transmitted according to different levels of social relationship: e.g. that different traits, such as a new way of carving an arrowhead, of binding an arrow foreshaft to a shaft, or of attaching a strap or mouthband to a string bag, require particular social settings and learning modes to facilitate their transmission. Thirdly, I have sought to analyse the distribution of these units to determine whether material culture can be used to explore the history of inter-group relations and the evolution of linguistic diversity; this has been done with an emphasis on identifying whether these units tell us anything about the relative sociality and mobility of men and women.

The analyses have, at least in part, achieved these aims. Firstly, attribute levels belonging to each class consistently demonstrated some level of non-random relationship to distance, and to a less extent language; most crucially, lowland and highland languages were consistently clustered according to their relative positions in either of the study area's geographic regions. Secondly, there was variability in the way that attribute levels exhibited sensitivity to either language or distance. This suggests that material culture attributes have been variably transmitted according to the range of social relationships and contexts that commonly exist for individuals living in these societies. Thirdly, the attribute levels of each class exhibited differences in the degree to which language groups clustered: while some binding and arrow shaping techniques exhibited a more direct relationship to language and/or distance, on the whole, arrow attributes demonstrated a more general relationship to the spatial distribution of language groups and tended to cluster less than string bag attributes.

While it may be that some arrow-making technologies require more intensive modes of conveyance, the patterning reflected by the 'Notched Foreshaft Culture' demonstrates that aggregates of sophisticated techniques may have been diffused between groups even where those groups were not engaged in intense interaction.

While it is possible that this technology may have been shared by the Mianmin, Oksapmin and Telefolmin for a considerable time, the almost total absence of this technology for groups surrounding these three is intriguing. Therefore, while the co-occurrence of this tradition for these three socially distant groups would suggest that the diffusion of this arrow technology has not been significantly impinged by cultural biases, the abrupt discontinuity of this tradition for surrounding Mountain Ok groups suggests that in these cases something has impeded diffusion of the tradition other than the factor of distance.

String bag attributes, on the other hand, demonstrate a stronger relationship with social affiliations between groups evident in the ethnographic record, at least in the case of CNG. The clustering of string bag attributes according to south-east or centre/west-north divisions is certainly attributable to there being a greater level of social interaction, possibly inclusive of ritual co-participation, exchange and marriage — and even sometimes conflict — between groups within these clusters; and, that it is apparent for string bags due to the fact that women's movement was clearly restricted to closer spheres of interaction associated with these factors. Importantly, these clusters also reflect the geographic conditions within CNG as there are far more geographic obstacles between the south-east and centre/north-west clusters than there are between groups within the clusters.

In reference to Boyd et al's (1997) models for cultural coherence, it is also clear that string bag traditions have greater cores of cultural attributes. This is apparent in the similarity in the way SB-B-MNTMXW, SB-C-STRCT, SB-DBDLPG, SB-E-MTHFN and SB-H-STRPATT have clustered the Mountain Ok groups. Therefore the sequences of attributes associated with these clusters provide examples that would indicate the existence of two prevailing technological systems. Relative to string bags, arrow traditions are more like assemblages of 'many coherent units' and, apart from the clear lowland/highland division and the phenomena of the NFC for BBAs, arrow attribute levels show little regularity in the way that language groups cluster.

At this level of analysis, it could be argued that the results reflect the findings of the Field Museum on the New Guinea north coast in that distance appears to be a

stronger factor in the distribution of cultural traits than historical relationships, as implied by language affinity. Overall, the transmission of a full range of attributes between groups appears to have been relatively strong for both string bags and arrows and cultural differences between groups speaking the same language have largely emerged as a result of diffusion rather than through the incremental process of drift. Men's culture, specifically in the form of arrows, reflect the widest dissemination of attributes — likely a part function of the chain of exchange ties — and it may be possible that this pattern reflects a similar one in which ritual forms were disseminated throughout the study area. Clearly, the distributions of arrow attributes are a reflection of the 'other directedness' which Foley, Mead and others have argued for New Guinea as a whole. As concerns women's culture, however, most attributes exhibit patterns that reflect closer social ties between groups, ones that would also be accompanied by a more persistent, intense and permanent movement of personnel between proximal communities.

This leads to an interesting question concerning Lapita. Clearly, material culture has been strongly shaped by interaction in the study area but in different ways for men and women's crafts. It would be interesting therefore to compare regional Lapita attribute distributions with those belonging to arrows and string bags to see whether Lapita attribute clusters reflect any patterns observed for either of these classes. On this matter, it is significant that the distributions of particular attribute levels associated with string bags appear to reflect close inter-group relationships, not regional trade and exchange patterns and extended social spheres facilitated by the movement of men. As Summerhayes (2000: 235) found for Lapita ware affinities between sites in West New Britain, the distribution of Lapita attributes appeared to have not been the result of broader exchange networks but rather 'social processes' were likely to have been at play including such factors as 'spouse exchange'.

The analyses reported in this thesis have demonstrated that the data are likely to yield many more significant results. Over the coming year the distributions of additional technological attributes, including those of other functional classes, will be analysed and it is expected that these will provide more certainty as to which attribute levels better reflect the effect of distance, language, or other factors.

Another important outcome of the analysis is the evident role of environmental factors in shaping variability in material culture as is apparent in the analysis of metric variables, specifically those associated with arrow dimensions. Because this relationship is quite strong it is likely that further analysis will reveal more relationships between the environment and formal properties of material culture classes. The question is whether there will be any relationship between the environment and nominal variables associated with technology. Further analyses therefore will place greater emphasis on the ecological divisions determined by the subsistence classes.

The most important research objective, however, involves the quantification of distance using the sum of collection points across the study area. This will involve the use of walking times derived from patrol reports and field diaries to establish measures of effective distance and to enable spatial analysis such as those described at the beginning of the previous chapter. Ultimately these will provide coefficients and other measures with which to determine the relative effects of language, distance and the environment for a more complete assessment of the mechanisms responsible for the cultural diversity of the study area.

Finally, analyses of decorative attributes belonging to both string bags and arrows will provide additional attribute levels for the two classes analysed in this thesis. As outlined above, the methods for achieving the various string bag pigmented designs require quite different technical repertoires. While, on the other hand, arrow designs generally involve a similar set of technical procedures their decorative programs can involve a number of different symmetrical structures that, as pointed out in Chapter 17, can be strongly directed by cultural preferences. Inverse to these constraints on dissemination is the relative visibility of decorative attributes, which means that there is likely to be a more active transmission of variants than for other attribute levels. Consequently the quantification of decorative attribute levels belonging to string bags and arrows could potentially provide additional evidence of the effect of differences between the genders' mobility and sociality on their material cultural assemblages.

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