Who are these people? Human skeletal remains from the Pacific region

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For more than 130 years, scholars have been debating the biological origin of the Polynesians. The early explorers were probably correct when they argued for Southeast or East Asia as a starting point for colonisation, as Polynesians have a suite of clearly Asian features, however many and varied theories arguing for a Micronesian, Melanesian, Japanese or South American origin have arisen since then.

The "fast-train" model is currently the most popular archaeological and linguistic framework in which to interpret the settlement of the Central Pacific region. This model states that modern Polynesians are directly descended from proto-Polynesian voyagers from island Southeast Asia, who subsequently voyaged from the Bismarck Archipelago region to the Central Pacific around 3600-2500 years BP (Bellwood 1989). The majority of biological anthropologists, from De Quatrefages (1864) to Howells (1973, 1979) and Pietrusewsky (1984, 1989, 1990), would agree with this basic construct. Pietrusewsky, for example, notes:
"Larger multivariate comparisons employing many more measurements recorded on crania of Pacific, Australian, Southeast Asain and East Asian populations strongly suggest a Southeast Asian origin of Polynesians. Other data from physical anthropology, dental and recent genetic data suggest a similar interpretation which does not support a Melanesian origin of Polynesians in the Bismarck Archipelago region." (1991:2)

It is also widely argued (Bellwood 1989, Pietrusewsky 1990) that the ancestors of the Polynesians were associated with a culture known as Lapita, which can be recognised archaeologically by its distinctive style of pottery, domesticated animals and voyaging skills.

There is a small number of archaeologists (Terrell 1986, White et al. 1989) however, who disagree with this model. Their arguments, that the Lapita culture was ancestral to that of the Polynesians and developed within island Melanesia, have led Houghton (1990) to assume that Polynesians physically evolved out of populations which had been resident within Melanesia for 30,000 years:

"Polynesians, considering their wide geographic distribution, show a remarkable homogeneity ... [thus] to settle Polynesia with a group evolved from one of the varied populations of Island Melanesia makes the simplest plausible thesis" (Houghton 1989: 229)

It is worthwhile noting that such a feat would require Polynesians to independently evolve a number of Mongoloid features, including the epicanthic eyefold, 9 base pair deletion (see below), and shovel-shaped incisors. An unlikely scenario under any circumstances and impossible in the present instance, considering the miniscule amount of evolutionary time available.

Geneticists generally support the majority view. Serjeantson and Hill believe that

"the extreme view ... that Polynesians evolved within Melanesia from a population resident there for at least 30,000 years, is untenable in the light of the genetic evidence. It seems quite implausible that a group evolving within Melanesia could have acquired, by chance so many non-Melanesian genes!" (1989:287)

Others, while also arguing for a southeast Asian ancestry for Polynesians conclude, from the evidence of ancient mitochondrial DNA (mtDNA) extracted from prehistoric Pacific skeletal material, that Melanesians were in fact the first to arrive in West Polynesia, followed, rather than preceded by, the southeast Asians:

"it appears that the earliest inhabitants of the central Pacific ... may have originated in Melanesia ... [this] implies that the Lapita culture was carried from its Melanesian homeland into the central Pacific by indigenous inhabitants of Island Melanesia rather than by Austronesian-speaking migrants from Southeast Asia ... our results give little credence to the traditional view that the Lapita people were essentially Polynesians" [italics mine] (Hagelberg and Clegg 1993:168).

The basis for their argument is that the 9 base pair (9 bp) deletion, a Southeast Asian mitochondrial DNA marker found in almost 100% of modern Polynesian individuals, is absent from the Melanesian islands of New Britain and Vanuatu, and from early samples (2700 - 1600 BP) from the Polynesian islands of Fiji, Tonga and Samoa, although it is present in a later Tongan sample.

It is evident therefore that there may be some element of doubt as to how closely the Lapita people and the Polynesians are related. So how do we define in biological terms what is meant by the word "Polynesian"? What does the skeletal evidence from Lapita sites actually show? What features are common to both?

To some extent skeletal studies in this region have begun to go round in circles. Metrically, the region has been analysed and reanalysed almost to the point of complete exhaustion and non-metric studies of morphological features on skeletal remains have also been fairly comprehensive. Such analyses have now proceeded as far as the techniques and human skeletal variation permit, without a new approach. There is still much

which can be done with the skeletal and genetic evidence that we have, but it requires new questions and new ways of looking at the data, for a meaningful reassessment of the validity of some of our current concepts.

There are two main areas of interest

1. The skeletal features which are classified as being "Polynesian" and/or of Lapita origin.

2. The geographic and temporal parameters of Pacific samples included in statistical analyses.

"Polynesian" skeletal features

Polynesians skeletal remains have generally been regarded by biological anthropologists as distinctive on the basis of a suite of features. This assumption is based on Houghton's (1980) description of Polynesians as having; a pentagonal-shaped head, rocker jaw, costoclavicular sulcus on the clavicle, oval-shaped fovea capitis on the head of the femur, robust and muscular limb bones, and shovel-shaped incisors (Houghton 1980, 1989, Pietrusewsky 1989).

The question as to whether Polynesians have an unusually high frequency of these features may not seem important. However the manner in which such traits have been used is critical. In analyses of what little skeletal material there is from Lapita sites, features such as rocker jaw have universally been cited as indicators of Polynesian affinity, hence the comments by Houghton: "one mandible showed Polynesian "rocker" characteristics" (1989:223) and Pietrusewsky: "similarities with Pacific populations, especially Polynesians, include "tall stature, presence of rocker jaw.." (1989:240)

The problem here however is that none of these features are exclusive to Polynesians; for example shovel-shaped incisors are Asian-derived and have a low incidence in Australoid populations. Some are environmental - the costo-clavicular sulcus is believed to be caused through the action of paddling a canoe (Houghton 1980). Others are an inextricable combination of genetic and environmental effects (eg. tall stature). Nor do such features occur in unusually high frequencies in Polynesians.

Perhaps the best example of the misuse of isolated features as indicators of biological affinity is that of the rocker jaw. A comparison of Pacific and circum-Pacific popula-

tions shows that while Polynesians have a high frequency of rocker jaw, the highest frequency (excluding extremely small samples) actually occurs in the Gulf of Papua New Guinea (Purari Delta) where the rocker jaw is present in 59/61 individuals, and in no populations, including those from China and Japan, do the incidences fall below 50% (see figure 1). In fact, the data could more reasonably be interpreted as indicating that rocker jaw is primarily an Australoid feature. Of 14 samples with the highest frequencies of rocker jaw, only two are Polynesian and the rest are either from Australia or New Guinea.It is not valid therefore to claim Polynesian affinities for Lapita material on the basis of skeletal characteristics which are no more particular to Polynesians, than they are to any other Pacific population. The Lapita people in general, far from looking like

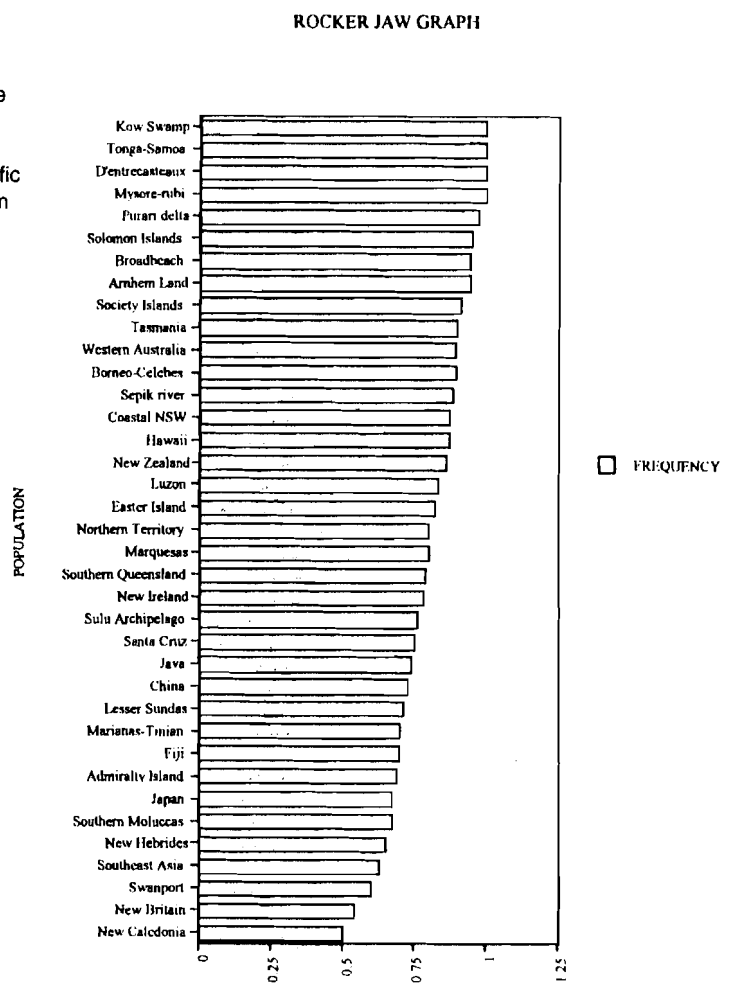

Figure 1
Graph of frequency of the rocker jaw mprphology across the Pacific (data taken from Pietrusewsky 1984).

Polynesians, actually show more differences than similarities, and it is these differences that we should concentrate on. It appears fairly clear that the Lapita-people were quite phenotypically distinct (Pietrusewsky 1989, Katayama 1990) from what we identify as Polynesian today. Pietrusewsky in a summary of Lapita skeletal characteristics notes:

"Univariate analyses indicate a number of similarities between Lapita skeletons and other Pacific, especially Polynesian, populations. These features include relatively tall stature, presence of rocker jaw ... moderate shovel-shaped incisors, well developed area for the attachment of the costo-clavicular ligament on the clavicle ... other skeletal and dental features which clearly differentiate the Lapita remains from other Pacific groups include wide low mandible shapes, small (microdont) teeth, and slender long limb bones." (1991:1-2).

These conclusions are also borne out by his multivariate analyses. In a cluster analysis based on the results of mandibular measurements (see Figure 2) the Lapita remains were isolated and furthest removed from Polynesia.

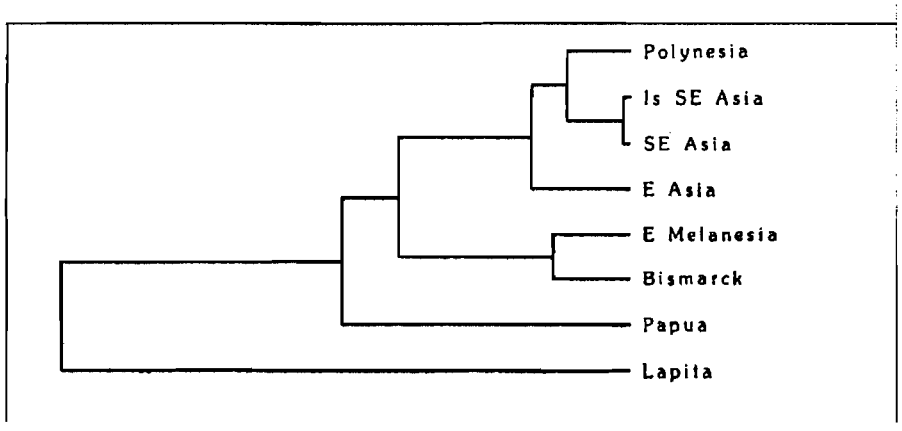

Figure 2
Diagram of relationship dased on a cluster analysis of d-squared results besed on 4 mandibular measurements (from Pietrusewski 1989: 243).

At some point therefore, if these are indeed the ancestors of the Polynesians, a great deal of phenotypic change or admixture had to have taken place. When, where and how did this happen, and are we going to find the answer simply by measuring and re-measuring near-modern crania of uncertain geographic and temporal provenance from museum collections? Probably not. It is my opinion that now it is time to take a diffe-

rent approach. What we need to look at is how the process of phenotypic change itself takes place. What effect does climate and diet have on phenotype? Are Polynesians really so skeletally homogeneous? The evidence, limited though it is, suggests not, yet it has been comfortable until now to assume that they are, primarily for the purpose of gaining larger sample sizes.

To my knowledge there have been no features found in isolation, which can be claimed to be distinctively Polynesian. What is needed then is a survey of the extent of so-called "Polynesian" features in populations outside Polynesia (and outside the Pacific) to see whether they occur in the same complex (i.e., pentagonal-shaped head with rocker jaw), or if indeed there are any features which can be said to be distinctively Polynesian. What part have environmental and cultural influences had to play in moulding the skeletal morphology of the Polynesians?

Geographic and temporal factors

Sample sizes in general in the Pacific are small, and because of this, museum skeletal material with very little geographic or temporal provenance has been conflated with archaeologically excavated remains, in order to maximise samples. However, even within the so-called homogeneous regions of Polynesia, evidence is increasingly pointing to diversity within as well as between island groups.

My analysis of infracranial skeletal remains from site To-At-36 on Tongatapu (van Dijk 1993), when compared to sites To-At-1 & 2 on the same island, illustrated that even geographically close sites may produce highly significant differences in metric measurements. Whether these are due to temporal, status, dietary or actual genetic differences is unknown. A hypothesis to account for such regional variation within islands has been proposed (van Dijk 1991) that looks at the effect that cultural and environmental factors (for example dietary differences between groups, and active selection for large body size in many Polynesian societies) may have had on a population's phenotype. A similar pattern of morphological variation within an island group has also been found in Fiji between the Sigatoka material (dated to 2000BP) and later Fijians (Visser 1995).

In cases where skeletal samples from the same island or island group have been differentiated geographically or temporally in statistical analyses, they often do not cluster together but form close relationships with other groups. Does this reflect biological differences or is there a problem with the methodology? Results like these are generally not addressed. Pietrusewsky (1989:242) in a comparative study of Lapita skeletal material with other Pacific populations, found a significant difference between archaic

(Wairau Bar) and modern New Zealanders. Discriminant function and generalised distance analyses showed that New Zealand and the Chatham Islands clustered together, followed by Namu, while Tonga and the northern Marianas are in a completely separate group along with Wairau Bar. The Lapita material did not cluster with any of the populations.

These and other examples highlight the dangers inherent in collating skeletal material from varying parts of the Pacific, plugging them into statistical packages and expecting to produce biologically meaningful results - yet this is consistently being done. A recent paper on non-metrics (Hanihara 1992:121) has included as a sample a "Melanesian" population consisting of "Fiji, New-Hebrides, New Guinea, etc. (recent)". This is by no means a biologically meaningful sample. This leads to the issue of applying biologically meaningful terminology to Oceanic populations. One of the fundamental difficulties in interpreting much of the literature in the Pacific is the unfortunate precedent of believing that there is some biological and cultural validity in the terms Polynesian, Melanesian and Micronesian, and to date a suitable solution has not been found.

Roger Green (1991) favours the terms "Near and Remote Oceania". Near Oceania comprises the islands from New Guinea east to the end of the Solomons chain at San Cristobel this gap marking the western boundary of Remote Oceania. These are fairly broad categories but perhaps that is all that is possible considering the extreme biological diversity found in the region.

So how should samples for comparison be chosen? It is important to separate samples strictly according not only to island group (eg., Vanuatu) but also particular islands within the group (eg. Erromango, Malekula) and areas within these - in particular - according to their temporal associations. Statistically it will be interesting to note the effects of clumping or not clumping the samples and to see if the effect of increased sample size is offset by a lack of geographic/temporal accuracy.

Work currently in progress includes a non-metric, genetic and morphological comparison of populations in Near Oceania and the western islands of Remote Oceania, with samples from Australia, Thailand and Eastern Polynesia as controls. I am particularly interested in populations not generally included in such analyses, due to their complex and admixtured biological history (for example the Polynesian Outlier - Namu). The aim being to look at Pacific populations across time and space with strict geographic and temporal control and to ask questions such as:

1. Is the non-metric, morphological and genetic evidence in agreement (and if not, why not?).

2. Does separating samples (within and between island groups and across time) makes any difference (and if so, how and why?).

3. What happens to known admixtured populations in statistical analyses - with whom do they show affinities? An example of the possible confusion surrounding this is the

biological profile of the Polynesian Outlier population on Taumako, excavated by Janet Davidson and Foss Leach in 1977. These burials are dated to about AD 1250-1600. Metrically and morphologically these individuals are very different to Polynesians. They are small in body size with rounded skulls and gracile facial morphology, lacking the Polynesian's large cheekbones, parietal bossing and sagittal keeling. Non-metric evidence however presents a different picture - here the so-called Polynesian markers - shovel-shaped incisors, Carabelli's cusp, rocker jaw, oval-shaped fovea capitis on the femur etc - occur frequently. Genetically, from the few DNA samples taken from this population, they also show Polynesian affinities with 100% frequency of the Asian genetic marker, the 9-bp deletion. This example serves to highlight the problems associated with choice of methodology and theoretical base, for any biological analysis in the region.

In conclusion this paper has briefly outlined some slightly different approaches for looking at the "origins" question in Polynesia such as ungrouping samples, looking at populations outside of Polynesia in order to biologically define Polynesia, and using a combination of methodologies such as genetics and osteological data to enhance research. There are also some factors I believe may be hindering current research, for example inadequate temporal and geographic separation of samples as well as inadequate definition of biological groupings and their associated phenotypic characteristics.

It has also been argued that continued use of Polynesia, Melanesia and Micronesia as homogeneous biological entities is inappropriate, due to the ill-defined and admixtured nature of these areas. Whether it is possible to divide Oceania into strict biological regions at all is questionable, and it is this broad question that I hope to address in future research.

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