

[This document gives parts of the original application to ESF; the sections have been selected so as to give an overview of the objectives and methods of the project.]

Pioneers of Island Melanesia: a joint project between British, Dutch, German and Swedish teams

ABSTRACT

In the islands of the Bismarck Archipelago (New Britain, New Ireland), Bougainville, and the Solomons chain (what we can call 'Island Melanesia'), there are currently a large number of languages spoken which belong to the Oceanic branch of the Austronesian family. Apart from these languages, there is a smaller set distributed through this area known as the East Papuan languages, which have no demonstrable relationship to the Austronesian languages, and which are difficult to relate even to each other. It is now widely accepted that the Oceanic languages spread with the Lapita culture-complex, which appears on the archaeological record between 4000 and 3500 before the present (BP). Radiocarbon dating has shown that Island Melanesia was inhabited by humans by at least 35000 BP, and it is widely thought that the East Papuan languages are descendants of languages spoken by at least some of these earlier, pre-Lapita, populations.

Our hypothesis is that these relic Papuan populations hold the key to understanding the pre-Austronesian past. There have been few waves of immigration moving through Island Melanesia; after the initial Sahul expansion there is no evidence for other influxes of people until the Lapita expansion. The special geographic situation of Island Melanesia, both its isolation and its position at the very end of a possible migration route, gives us an unusual opportunity to untangle prehistoric layers of settlement. This situation is in stark contrast to other areas of the world, such as Europe, where constant population movements have obscured this level of deep prehistory beyond hope of detailed reconstruction. An interdisciplinary approach to the area is most likely to be revealing; we plan to combine linguistic, biological anthropological, archaeological and genetic sources of information in a methodologically well-informed manner.

The project will investigate the original settlers of Island Melanesia, and by combining evidence from different disciplines, it will build a composite picture of the settlement patterns, population structure and linguistic relationships between these pioneering peoples.

Investigation into the Papuan languages of the area can tell us much about early contact relationships between the languages and thus their speakers. In particular the project will investigate whether there is any linguistic evidence of smaller divisions or zones of intensive contact between the Papuan languages. An archaeological survey will begin to assemble a catalogue of pre-Austronesian technological features, as well as clarifying how widespread the early population of the outlier islands was. Collection of genetic and biological anthropological material from some of the outlier Papuan groups will enable us to assess levels of genetic relatedness between the populations. Through comparison of anthropological features we will situate our emerging picture of the populations in their ecological context. Methodological development in the modelling of linguistic, demographic and ecological change will place patterns found in Island Melanesia within a strong theoretical framework, which in turn will allow us to separate out layers of cultural influences.

It is envisaged that from this composite picture of deep prehistory it might ultimately be possible to show evidence of wider relationships between the East Papuan languages and peoples and the languages and peoples of mainland New Guinea, or Australia.

RESEARCH PROJECT

A. BACKGROUND: STATE OF THE ART

This project involves researchers from centres in the Netherlands, the United Kingdom, Germany, and Sweden. It also involves a large range of disciplines focussing on a single geographic area, and thus falls under two of the announced EURO-CORES topics, Language and Archaeology, and Language and Genes.

We propose an interdisciplinary investigation of the deep prehistory of Island Melanesia, an area including the islands of the Bismarck Archipelago (New Britain, New Ireland), Bougainville, and the Solomons chain. Prior to at least 35000 BP and until about 4000 BP these islands represented the furthest Eastern human colonisation of the Pacific. During this period there were major geographic, ecological, demographic and cultural changes in the region, and traces of these changes are available in the present. Advances in the study of post 4000 BP history of the region (in particular, the rise of the Lapita culture complex, which originated in Island Melanesia and colonised almost all the outer islands of the Pacific), mean that it is for the first time practical to attempt to get beyond the developments of the last 4000 years and begin the reconstruction of ancient prehistory. This is a complex task which crucially requires an integrated interdisciplinary approach grounded in the disciplines of genetics, biological anthropology, archaeology and linguistics.

In a yet deeper (pre-)historic perspective, reconstruction of the processes of human settlement of Island Melanesia opens the question of human settlement of Sahul, the continent including modern Australia and New Guinea, which existed until divided by rising sea levels at about 8000 BP. Island Melanesia also consisted of fewer, larger islands during this period, but there was always a sea crossing between Island Melanesia and Sahul proper. While the human history of Sahul is perhaps too much to approach directly, a more detailed appreciation of Island Melanesia, and in particular, the methodological development this entails, will make the study of the prehistory of Sahul a realistic prospect.

Island Melanesia is an important area of study for the understanding of human settlement of the world. In contrast with regions such as Europe, where complex population movements have erased much contemporary evidence of population origins, Island Melanesia offers a rare opportunity for the reconstruction of deep prehistory. Island Melanesia forms an archipelago strung out near the end of one possible route of the expansion of human settlement, and the simplest hypothesis is that this archipelago has been subject to only two major waves of migration (around 35000 BP and 4000 BP), although other scenarios, for example of sequential waves of immigration and/or back-migration, are also possible. The peopling of this area so early shows that we have seriously underestimated the sea-faring capabilities of pre-neolithic peoples, which has implications for other early migration events like the peopling of the Americas. This makes Island Melanesia a special case in world prehistory, the understanding of which could ultimately shed light on ancient people movements in other areas of the world.

SAHUL AND THE INITIAL COLONISATION OF ISLAND MELANESIA

Throughout the Pleistocene sea levels were much lower than at present; at 35000 BP they were briefly -65m, and between 26000 and 11000 BP they ranged between -65m and -130m. Until about 8000 BP, New Guinea and Australia were joined in a continent known as Sahul. Bougainville and the Solomons chain were also mostly joined to each other, but throughout the period of human occupation they were never connected by land to Sahul proper. Bowdler (1993: 66) suggests SE Asia, Wallacea, and the Sahul continent were colonised at around the same time, around 50000 to 40000 years ago. For Island Melanesia, Mountain (1993: 123) gives evidence of settlement in New Ireland from 30000 BP and soon after that in the Solomons. Wickler and Spriggs (1988) report 29000 BP for the Kilu site in the northern Solomons (Allen, Gosden and White 1989: 548). Gosden and Robertson (1991) report a first occupation site of New Ireland of 35400 BP. At this stage travel to Island Melanesia from mainland Papua New Guinea would have involved water crossings of up to 65 km; the Island Melanesia settlement date confirms that humans had the technology and ability to be capable of this. Sea-faring abilities of this nature would have allowed people to reach the end of the Solomons chain. There is no evidence of colonisation further out into the Pacific, and there is reason to suspect that such evidence will not be forthcoming. Although it appears that the sea-faring abilities of Pleistocene peoples have been seriously underestimated, and voyages to at least some of the outer islands would have been technically possible, Spriggs has argued that due to environmental limitations, colonisation of the outer islands of the Pacific would require a sophisticated agricultural economy, for which there is only evidence in the region with the Lapita people in 4000 BP (Spriggs 1997: 65).

GEOGRAPHICAL CONSTRAINTS AND RECONSTRUCTING DEMOGRAPHY

The biological-geographical nature of Island Melanesia means that patterns of human habitation and interaction differed significantly from those in mainland New Guinea. The Pleistocene people seemed not to be able to colonise further to the east of the Solomons, where sea crossings were larger (up to 300 km) and the target islands were smaller. More important however is the relative poverty of flora and fauna, in particular the absence of larger mammals, and relative lack of terrestrial fauna in general.

A major biological division separates mainland New Guinea from Island Melanesia in that mainland New Guinea has far greater biological diversity; for example there are 256 bird species in mainland New Guinea, compared to 80 in New Britain, which also has very few terrestrial mammals, and far fewer plant species. Biological diversity becomes yet sparser at the end of the main Solomon Islands chain, with another major biological division between San Cristobal and Santa Cruz, and again between Vanuatu and New Caledonia (Spriggs 1993: 187).

It appears that to move east of the Solomon Islands, to Santa Cruz, Vanuatu and beyond, people would have had to have relatively sophisticated means of manipulating their food supply, such as an agricultural economy, based on crops and domesticated animals (Gosden 1993, Wickler and Spriggs 1988). In fact it appears that the first people to have reached Vanuatu (and indeed Santa Cruz, Banks, and the Loyalties) were Austronesian speakers, around 4000 years ago.

While the Pleistocene people of Island Melanesia did not have the sophisticated agricultural economy which was necessary to successfully colonise the outer islands of the Pacific, there is still evidence of intentional enhancement of the food-producing capacity of their environment. There is archaeological evidence that a series of food animals were brought to the islands, including the Gray Cuscus (*phalanger orientalis*), a tree-dwelling marsupial which first appears in the Bismarck Archipelago between 20-18000 BP. During the same period there is also evidence for the introduc-

tion of a wallaby species and of several varieties of rat. Plant species were also introduced, including species of the *canarium* almond.

The earliest evidence of settlement suggests relatively low population living in dispersed coastal settlements. Due to the low population and the poverty of natural resources it is unlikely that these groups were biologically or socially self-sufficient (Gosden 1993: 133). Flakes of obsidian from New Britain appear in New Ireland archaeological sites dated 20-18000 BP. The source of the obsidian is 350km away (and further by likely coastal routes). By the terminal Pleistocene/Early Holocene, New Britain obsidian regularly occurs in all New Ireland sites, suggesting well developed contacts and trade relationships.

LAPITA CULTURE-COMPLEX

Between 4000 and 3500 BP a new culture (or group of cultures) appears on the archaeological record. This culture(-complex) is known as Lapita, after the first site where finds were made. Lapita sites are highly characteristic, reflecting a people with sophisticated agriculture, pottery, and navigation. The record of the Lapita people begins in Island Melanesia, from where they rapidly colonised the entire Pacific. Our knowledge of the Lapita peoples is greatly improving, with new discoveries and interpretations being regularly reported (e.g. Kirch 1997). As the reconstruction of Lapita history advances, the possibility of reconstructing pre-Lapita history has become correspondingly realistic.

It has been established that the spread of the Lapita cultural complex corresponds to the emergence and spread of the Oceanic branch of the Austronesian family of languages. In present-day Island Melanesia there are a large number of Oceanic languages spoken, and a smaller number of so-called 'East Papuan' languages. The East Papuan languages have no demonstrable relationship to the Austronesian languages, and are difficult to relate even to each other. It is widely held that the Papuan languages are the descendants of the languages spoken in Island Melanesia before the spread of the Oceanic languages.

Some scholars argue that the origins of the Lapita cultural complex are to be found in a synthesis of the cultures of immigrant Austronesian-language speakers and native Papuans (Kirch 1997). Recent genetic analyses focussed on Y-chromosome polymorphism (inherited along the male line) suggest that there was long term interaction between Austronesians and pre-Austronesians before or during the Pacific expansion. Interestingly, mtDNA (inherited along the female line) data does not seem to show the same. However, the necessary research has not yet been done to determine to what extent the present day speakers of Papuan languages differ genetically from speakers of Austronesian languages in Island Melanesia.

B. OBJECTIVES

The objectives of this project are to examine the Papuan-speaking populations of Island Melanesia from the point of view of linguistics, archaeology, anthropology and genetics, in order to understand the settlement and subsequent partial dispersal of the first inhabitants of Island Melanesia. Our project focuses on deep prehistory from 30000 to 3000 BP, which is the period from the original settlement of Island Melanesia up to the major upheaval in language, culture and population that came with the Lapita people.

C. METHODOLOGY

The linguists will collect linguistic data by fieldwork and carry out typological and historical comparison to examine the relationship between the Papuan languages, and between Papuan and Austronesian languages. The geneticists will collect and analyse mtDNA and Y-chromosome samples from Papuan and Austronesian populations in the region, in particular those of Rossel Island and Santa Cruz. The biological anthropologists will collect and analyse evidence of biological variation between Papuan and Austronesian populations. The archaeologists will carry out survey and excavation work in the Bismarcks. Detailed information on the specific subprojects of each discipline comes below, in the individual descriptions of each module.

D. HYPOTHESES AND EXPECTED RESULTS

Our hypothesis is that these relic Papuan populations hold the key to understanding the pre-Austronesian past. The archaeological view of small groups of populations with frequent inter-group contact has major linguistic implications: if such groups existed, it may be possible to show linguistic evidence of such contact through the comparison of extant Papuan languages. On the other hand, a lack of evidence of contact between these languages would indicate a major rethinking of the archaeological picture. It may be that the model is too simple; for instance, there may have been further waves of immigration for which we have thus far not seen evidence. Genetics research will link into the archaeological and linguistic research and show to what extent there has been population mixing, and may suggest patterns of early migration. Archaeological evidence will provide a basic time-frame in which the genetic and linguistic evidence can be grounded.

An interdisciplinary approach to the area is most likely to be revealing; we plan to combine linguistic, anthropological, archaeological and genetic sources of information. Interpersonal connections made possible by the project will make the findings of each discipline accessible to the others. Field sites will be chosen in order to maximise the usefulness of possible findings for each discipline, and wherever possible combine the efforts of several disciplines at a single site.

Outcomes of the project will include a number of scientific papers in each of the relevant disciplines, as well as reporting interdisciplinary methodological developments; yearly joint workshops in which all the teams discuss their work in progress; more frequent workshops in which each team discusses its preliminary findings; a major international conference towards the end of the project involving outside scholars; and an edited book arising from the conference papers. This book will represent the state-of-the-art in Island Melanesia prehistory.

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THE PROJECT MODULES

LINGUISTICS

The linguistics side of the project will be undertaken by the Dutch and Swedish teams. Apart from the large-scale hypotheses of language relatedness of Greenberg and Wurm, which have included the Papuan languages of Island Melanesia in their scope, there has been very little scholarly attention paid to these languages. Still less scholarly attention has been paid to their relationships to each other. The conclusions of Greenberg and Wurm are largely taken as preliminary hypotheses, due in part to the minimal amounts of data on which they were based. Archaeological and genetic work needs a much better linguistic base than presently exists, to enable these disciplines to relate their data on populations to linguistic groupings. Linguistic work is needed to establish primary groupings of Papuan languages, in order to point out possible areas of interest for archaeological and genetic work.

If the Papuan languages of Island Melanesia are the descendants of the languages of the earliest populations of the islands, the question immediately arises of whether they are related to each other. Similarities between the Papuan languages could arise from two causes: genetic relatedness (i.e. descent from a single ancestor language) or language mixing through contact.

If people came to Island Melanesia as a single wave of immigration approximately 35000 years ago, with one cultural group sharing one language, the resulting diversification of languages may have led to the familiar family-tree type model posited for other areas of linguistic spread (e.g. Indo-European languages, and indeed Austronesian). In this case the traditional family tree model of linguistic relatedness can be deployed. However the time depth of such an expansion is potentially so great as to be far beyond the capacity of the traditional comparative method, which in general is useful for time depths of up to about 4000 years.

Another possible strategy for examining relationships between the East Papuan languages is an approach pioneered by Johanna Nichols (1992, 1997), which uses comparison of typological features to investigate extremely ancient linguistic contact. Even if the East Papuan languages turn out not to be genetically related (i.e. not originating from a single ancestor language), the archaeological picture of small groups of people in long-term contact is a particularly suggestive one for linguistic research. Long-term linguistic contact between different languages almost inevitably leaves linguistic traces: if there was contact between the Papuan languages for millennia before the arrival of the Lapita peoples, this contact should still be discernible in the form of shared linguistic features. High-level, long-term contact at this level of antiquity may be indistinguishable from genetic relatedness.

Research so far shows that, in contrast with the closely related and relatively homogenous Oceanic Austronesian languages in the area, East Papuan languages are strikingly diverse. However they do exhibit a number of shared features. For instance a particularly characteristic feature of languages of this area is gender: almost all the East Papuan languages show gender systems, with between one and perhaps five genders. However, research currently in progress (by Terrill) suggests that only two of the New Britain languages, Anêm and Ata, appear to show cognate gender systems; all the others appear to be based on very different structural principles, with non-cognate morphology. However the fact that gender is a structural part of almost every East Papuan language is itself indicative of long-term contact at the least.

The linguistic project thus has two goals. One is to establish the contact relationships between the languages: to what extent are there significant similarities between the languages which are attributable to long-term contact. The second goal of the project is establish to what extent it is possible to make claims about the genetic relatedness of the east Papuan languages. It may conceivably be possible to go further and establish family trees of relatedness, similar to the familiar Indo-European model.

These goals will be achieved by detailed comparison of linguistic sub-systems and evaluation of shared typologically relevant features. As many of the East Papuan languages are understudied, part of the research will involve primary fieldwork to provide data for the comparison. Field sites will be determined in consultation with the geneticists, anthropologists and archaeologists. Ger Reesink will concentrate on the languages of the Bismarcks, in co-operation with Eva Lindström of the Swedish team. Michael Dunn and Angela Terrill will carry out investigation of the languages of the Central Solomon Islands and Santa Cruz. Stephen Levinson will focus on Yele Dnye, the language of Rossel Island. Dunn, Levinson, Reesink and Terrill will be based jointly at the Katholieke Universiteit Nijmegen and Max Planck Institute for Psycholinguistics in Nijmegen. Lindström will be based at Stockholm University.

GENETICS

The goal of the genetic work will be to test hypotheses concerning the relationships of Papuan and Austronesian-speaking populations in the Louisiade Archipelago and the Santa Cruz islands. These two areas are particularly interesting to contrast; the Louisiade Archipelago is a dead-end in terms of migration routes; whereas Santa Cruz was the embarkation point for successive waves of Lapita migrations. These contrasting histories may be represented in the genetic record of the current inhabitants of these areas.

The Papuan-speaking groups in the specific areas we wish to sample (Rossel Island in the Louisiade Archipelago in New Guinea, and the Santa Cruz Islands in the outer Solomon Islands) are surrounded by Austronesian-speaking groups. Are these Papuan-speaking groups genetically more closely related to other Papuan-speaking groups in Melanesia, or are they genetically more similar to their geographic neighbours that speak Austronesian languages? Demographic analyses of the molecular genetic data can also shed light on the history of the populations. For example, if the Papuan-speaking groups from Rossel and Santa Cruz are genetically related to other Papuan-speaking groups from elsewhere in Melanesia, this could reflect either an ancient, widespread distribution of Papuan-speaking peoples, or it could reflect a more recent migration of Papuan-speakers to these islands. The patterns of molecular genetic variation can be examined for evidence of prehistoric population expansions, which (if present) can be roughly dated with the aid of demographic models, which should then distinguish between an ancient vs. recent expansion of Papuan-speakers to Rossel and/or Santa Cruz. In combination with the linguistic, archaeological, and anthropological data, the genetic data should provide a comprehensive picture of the relationships of these populations.

To carry out the molecular genetic studies, samples will be collected from Yele Dnye-speaking populations on Rossel Island, and from Äiwo and Santa Cruz-speaking populations from the Santa Cruz islands. Samples will consist of cheek swabs, which are non-invasive, easy to obtain, stable in the field for months at ambient temperatures, and provide sufficient DNA for molecular genetic analyses. Ideally, 50 males will be sampled from each group, to provide an accurate depiction of the genetic variation in each group. The sampling will focus on males, because only males have both mitochondrial DNA (mtDNA) and Y-chromosomes, which are the two types of genetic markers that will be analysed.

MtDNA is strictly maternally inherited, and thus provides insights into the maternal (female) history of populations. Previous work has demonstrated that Austronesian-speaking populations are associated with a particular mtDNA marker (the 9-bp deletion), which attains frequencies of 80-100% in Polynesian populations, but is absent from highland New Guinea (Hertzberg et al. 1989). Another region of the mtDNA genome, termed HV1, is also informative for population studies, so the mtDNA work will consist of typing samples for the 9-bp deletion and sequence analysis of the HV1 region. Extensive comparative data exists for these mtDNA markers in Melanesia and Polynesia (Stoneking et al. 1990; Lum et al. 1994; Melton et al. 1995; Redd et al. 1995; Sykes et al. 1995), to provide a context for the data from Rossel and Santa Cruz.

The Y-chromosome is strictly paternally inherited, and thus provides insights into the paternal (male) history of populations. Previous work has shown that authentic native Polynesian Y chromosomes consist of just two types, a majority type that originated in Melanesia called DYS390.3del, and a minority type that originated in SE Asia called M122; however, the major Y-chromosome type in New Guinea is M4, which is not found in Polynesia (Kayser et al. 2000; Su et al. 2000; Capelli et al. 2001). We will analyse these three Y-chromosome markers; any Y-chromosome types that do

not have these three markers will then be analysed for other markers to determine the Y-chromosome type (in particular, to exclude the possibility of recent European admixture). In addition, we will analyse 9 rapidly-evolving markers, termed Y-STR loci, that will shed further light on the relationships and demographic history of the major Y-chromosome types determined by the DYS390.3del, M122, and M4 markers.

The data collection will be carried out by Manfred Kayser, and the analysis by Mark Stoneking and Manfred Kayser using the laboratory facilities of the Max Planck Institute for Evolutionary Anthropology, Leipzig.

BIOLOGICAL ANTHROPOLOGY

From a biological point of view Island Melanesia, the population history of which has been outlined above, poses a number of challenges and offers a number of opportunities. The language-based hypotheses developed earlier have two elements to them. The first element relates to the actual linguistic processes of diversification and change, which are influenced by both socio-cultural factors and the internal processes of language change. The second element is that the language patterns reflect population histories, and these in turn hinge upon the demographic and ecological context in which colonisation, and intensification has occurred. The biological components of the project, as well as the archaeological and genetic ones, relate to understanding the patterns and process of these demographic histories.

Biological history is shaped by a number of processes. Populations grow, disperse, adapt, become isolated, become absorbed and admixed, and become extinct. Any regional history is the sum of these patterns, and morphology, genes, culture and languages are likely to reflect these processes. The challenge is to tease out the number of such events, their duration, and the relative importance of local adaptation and isolation and admixture, and in turn to balance the extent to which the resulting mix is a product of adaptive processes or more stochastic ones such as drift and founder effect.

Island Melanesia offers an ideal opportunity to construct such a biological history. From the empirical point of view evidence can be obtained from: a) existing cranial and skeletal collections from around the world; b) the acquisition of new skeletal data from indigenous sources; c) published data on both skeletal and anthropometric diversity; d) genetic data from living populations, and possibly ancient DNA extracted from skeletal samples; e) collateral archaeological evidence from Island Melanesia that can show first appearance, breaks in occupation, density of occupation, cultural relationships, and biological affinities of commensals. All these data sources will be accessed in this project.

The key questions we will be asking, using these data sources, are: 1) to what extent are the populations of Island Melanesia morphologically distinct from those of the Papuan mainland, and indeed, to what extent it is valid to treat the latter as a comparative unit? 2) to what extent are the populations of the different archipelago systems of Island Melanesia distinct (e.g. the Bismarcks, relative to the Solomons, relative to the Louisiade Archipelago? 3) this approach can be continued in a scale free manner – for example, exploring diversity within each region, and investigating hypotheses concerning whether certain parts of each island archipelago (e.g. the smallest islands, the most remote islands, the most eastern islands, etc.) show distinctive biological patterns; 4) to what extent the patterns found reflect linguistic, cultural or historical differences (e.g. Papuan speakers versus Oceanic speakers, etc.)? 5) alternatively, to what extent they reflect adaptive differences (e.g. in body size, which is known to vary considerably across the region) – responses to local environ-

mental conditions, such as the prevalence of malaria, the availability of protein sources, degree of agricultural intensification, etc.? 6) to what extent patterns found relate to known archaeological history – i.e. length of colonisation, degree of isolation, and known cultural connections? 7) to what extent biological data can be used to identify the number of biological (dispersal events) substrates and their relationships within Melanesia as a whole?

These questions can be approached using a number of different methods and datasets. The primary one will be the use of morphometrics. The Cambridge Human Diversity Databases already contain substantial records of Melanesian biological variation. This is mostly Papuan, and a major focus of the project will be to enhance the data on Island Melanesia. Genetic evidence will also be used to this end (see above), and exploratory investigations of the viability of ancient DNA in this region will be pursued. GIS and field surveys, as well as comparative medical and ethnographic databases (also available in the Cambridge Human Diversity Databases) will be employed to construct a robust ecological framework. This work will be done in close collaboration with the archaeologists on the project. Analyses will be done employing statistical techniques as well as the emerging methods of phylogenetics (Pagel and Mace, Collard & Shennan).

These specifically biological questions are intimately linked to the linguistic hypotheses developed here in the following ways. In particular, we will collaborate with the linguistic projects to determine correlation (or lack of) between such entities as the Lapita complex and biological variation; between the East Papuan speakers and the Austronesians; and to consider the relative scales of biological and linguistic diversity in the region, to test Nettle's models of non-linear linguistic diversification.

In sum, the goal of this part of the project will be to provide a sound biological framework for the emerging historical linguistic models that will be developed, and thus to test through what can be considered a micro-evolutionary approach the mechanisms by which the Cavalli-Sforza genes-language correlations may both be produced and erased or obscured.

The work will be carried out primarily by a team in Cambridge, based at the Leverhulme Centre for Human Evolutionary Studies. Lahr will direct the morphological analyses and data programme, and will work in collaboration with the genetics team; post-doctoral assistants will play a major part in the data collection and analysis.

THEORY BUILDING: LINGUISTIC, DEMOGRAPHIC AND ECOLOGICAL COMPONENTS

The impetus for the study of the relationship between linguistic diversity and genetics or evolutionary history has come from a number of empirical studies. Principal among these was Piazza et al's correlation of language families and genetic distance. Another important study, leading to a number of important insights was Renfrew's linkage between Indo-European and the spread of farming in Europe, and more recently Bellwood's farming dispersal hypothesis relating to Austronesian. These studies have shown that the methods and approaches are available in both linguistics and genetics/archaeology to determine the relationships in these important anthropological components. Much of the Island Melanesia project developed here is an extension of this approach.

However, there have been relatively few studies that have explored the issue theoretically. This is necessary for several reasons. The Cavalli-Sforza model is broadly descriptive, but suffers from several problems; first, that there is no consensus to the linguistic tree employed, and hence the correlations may be linguistic model sensitive; second, even if the linguistic phylogeny is correct, it is essentially star shaped, lacking depth and a robust hierarchy. As has been shown for genetic systems, this

means that the phylogenetic signal is weak. And third, genetic and linguistic systems suffer from geographical autocorrelation, making interpretations of correspondence statistically problematic.

These are not intractable problems, but require theoretical refinement and development, and these will be a major focus of this project. Two approaches will be developed. The first will be located specifically in Island Melanesia. Correlations between biological history and linguistics arises from microdifferentiation (which can occur over relatively few generations). This will work at much finer levels of analysis than Cavalli-Sforza et al. (1988), paying particular attention to mismatches between geographic and linguistic distances. Studies using such approaches have found that, whilst language barriers can also be barriers to gene flow (Barbujani 1991, 1997; Barbujani and Sokal 1990), and at least some language expansions are coupled to genetic clines (Barbujani and Bertorelle 2001), geography is often the more powerful determinant of genetic identity, since the events which leave their signature genetically are of a much greater time depth than those traceable linguistically (Ward 1999; Sykes 1999). Furthermore, given the importance of the geographical element in the information, we will explore the use of biogeographic models. Biogeographers and population geneticists have developed a number of formal theoretical models to predict levels of diversity and the nature of adaptation on islands in relation to their size, distances, and ecological circumstances (e.g. isolation by distance, shifting balance theory, area-diversity models). Island Melanesia, with its relationship to mainland Papua, and with the different sea level histories of the islands, offers an ideal opportunity to see whether human demographic, genetic, cultural and linguistic patterns conform to these more general models. The results of these will give insights into the mechanisms of linguistic change, as well as throwing light on the ecology of colonisation. GIS, palaeobathymetry, and models of island relationships will be used to develop these models for Island Melanesia.

The second approach will be global and comparative. The demographic and linguistic history of Island Melanesia is nested in broader regional and global contexts. The Cavalli-Sforza models are essentially tree-based, and demand confidence in those trees. An alternative is to focus on patterns of diversity in different systems (numbers of languages, heterozygosity in different genetic systems) and to model the conditions that either produce or inhibit diversity. Initial work (Nettle, Foley and Lahr, in prep) have shown that regional and global patterns of diversity vary according to the measures used. Both model building and empirical analysis of patterns of diversity will be developed, with the aim of enabling the patterns found in Island Melanesia to be placed within a stronger theoretical framework, thus enhancing the initial proposals of the Cavalli-Sforza model.

Foley and post-doctoral assistants will be responsible for the theoretical modelling and diversity analyses.

ARCHAEOLOGY

The earliest archaeological record of Island Melanesia is clearly bounded by two events, the initial colonisation of the islands perhaps 40000 BP, and the appearance of the Lapita culture complex in 3500 BP. Linguistics and genetics provide contemporary evidence of the pre-Lapita peoples of Island Melanesia. Comparison of the archaeological record to linguistic and genetic data allows us to form well-grounded hypotheses about the processes of colonisation and cultural contact that result in the present distribution of languages and peoples.

The archaeology of a series of islands provides a set of clues to changing forms of interaction and connection through the distribution of sites, the movement of materi-

als and the spread of colonisation. The pre-Lapita history of the region can be divided into two phases, each of which might have created their own linguistic universes. Archaeologically attested changes in forms of interaction and connection during the Lapita period have brought with them their own layers of linguistic and cultural influence which need to be understood in order to understand the earlier context.

From at least 35000 to 20000 years ago the archaeology of the Bismarck Archipelago, Bougainville and the Solomons chain suggests a situation of sparse and mobile populations moving by sea, but also inland into New Britain and New Ireland. The sites we have from this period (e.g. Matenkupkum, Buang Merabak and Yombon in the Bismarcks) have small amounts of material in them indicating low-level use. After 20000 years ago there is evidence that people changed their subsistence strategy. Instead of moving themselves between dispersed resources, they start to move the resources to them, providing the foundations for later exchange systems. Obsidian moves over some hundreds of kilometres and the introduction of new animal and perhaps plant species occurs at this time, showing evidence of environmental manipulation. This system continues and complexifies into the mid-Holocene.

There is currently very little evidence as to the causes of this transition to a new level of social complexity around 20000 BP, but archaeological investigation is likely to provide vital clues.

The history of the region after the appearance of the Lapita cultural complex is relatively well known. With the introduction of Lapita pottery 3500 BP the internally linked communities of the Bismarck Archipelago are suddenly linked to island communities throughout the western Pacific. The widespread nature of Lapita assemblages indicates that Lapita represents a form of community quite unlike anything in the present or recent past. The fact that pottery is identical in form and decoration (the latter often being very intricate) from Manus to Tonga and that pots change in the same manner of the whole of this area for some 1000 years indicates some sort of communication and information flow over a very large area. We can posit a variety of different linguistic conditions within the overall Lapita super-community.

The link between the current distribution of the Oceanic branch of the Austronesian language family and the spread of Lapita over the Pacific is well established. However, in the areas settled prior to Lapita—from the Bismarcks to the end of the Solomons—there is no evidence for mass migration of peoples from outside. Austronesian languages may have spread through Island Melanesia as inter-group languages which facilitated communication within the area and with regions to the west. This form of communication may also have helped the movement of people, flowing through these networks, rather than migrating en masse. In the newly settled areas—Vanuatu to Tonga and Samoa—if settlement was complex in social terms and involved people from a number of different groups and languages, the inter-group Austronesian languages may have become the only language from a very early stage, leaving no trace of any non-Austronesian (i.e. 'Papuan') languages. This model is attractive from an archaeological point of view in that it does not necessitate a mass migration of people into the Bismarcks and Solomons, for which there is no evidence, but does provide a mechanism for the movement of Austronesian languages into the area and a means of understanding the forms of communication which must have been necessary to produce such similarity in the pottery over such large areas. To test this hypothesis it would be necessary to seek evidence of links with the west in the Lapita and immediately pre-Lapita periods, as well as finding more artefactual evidence of the nature of Lapita networks of exchange and communication.

In the last 1000 years the major linguistic changes in Island Melanesia are away from non-Austronesian and towards Austronesian languages. This may be due to the rise of the recent exchange systems, which has been documented ethnographically. We

need to ask whether there anything about the nature of exchange and speech communities that we could use to link the two, and whether it is possible to make specific links between mechanisms of exchange between groups and the language shifts. The archaeology of the recent period can be complemented by the analysis of museum collections of material culture that provide evidence of exchange and connectedness over the last century. A better understanding of cultural and linguistic change over the last 1000 years is crucial for developing an adequate model of remote Island Melanesia prehistory.

The present project will collate the archaeological evidence from all these periods, significant elements of which remain unpublished, and will concentrate fieldwork on areas where there is the possibility of pre-Lapita, Lapita and post-Lapita evidence showing shifting forms of connectedness and exchange. The Duke of York islands between New Britain and New Ireland, Lavongai in New Ireland and the offshore islands of New Ireland, such as Lihir are likely targets of survey and excavation. Fieldwork will be carried out and co-ordinated by Gosden, aided by Christina Pavlides (presently of La Trobe University, Melbourne), and students from the University of Oxford, and will be linked into fieldwork being carried by Glenn Summerhayes of the Australian National University.