

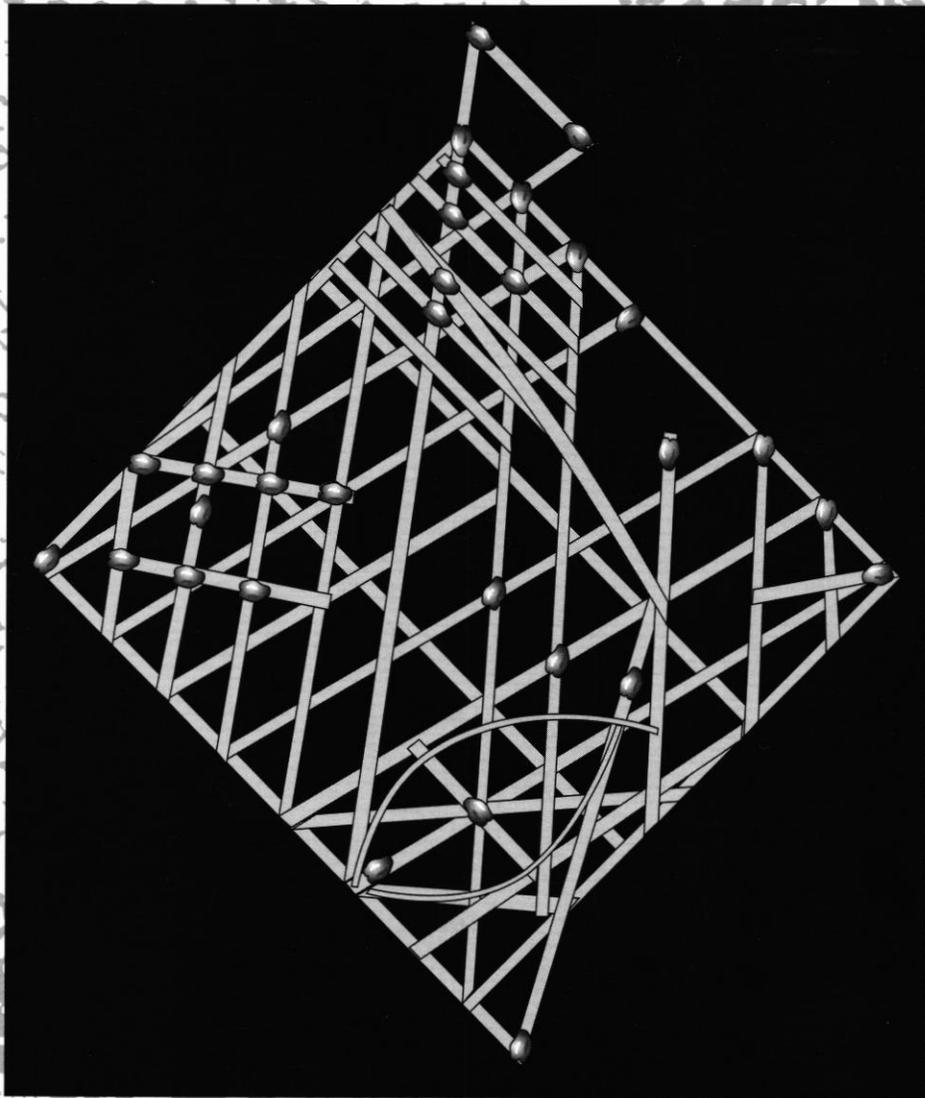


**NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION MONOGRAPH 21:
Marshall I. Weisler (ed.), *Prehistoric Long-Distance Interaction in
Oceania: An Interdisciplinary Approach***



This document is made available by The New Zealand
Archaeological Association under the Creative Commons Attribution-
NonCommercial-ShareAlike 4.0 International License.

To view a copy of this license, visit
<http://creativecommons.org/licenses/by-nc-sa/4.0/>



PREHISTORIC LONG-DISTANCE
INTERACTION IN OCEANIA:
AN INTERDISCIPLINARY APPROACH

Edited by Marshall J. Weisler

21

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION
MONOGRAPH

INTRODUCTION

Marshall I. Weisler

The human colonisation of Oceania was one of the most remarkable achievements in world prehistory, and the strategies employed during the settlement of the Pacific and subsequent diversification of island societies are key issues in Oceanic archaeology. Once the hundreds of islands across the vast span of Oceania had been settled by small founding groups, subsequent diversification of island societies - especially in the eastern Pacific - is generally thought to have proceeded in relative isolation. However, documenting the changing role and significance of inter-island contacts in sociocultural change has drawn increased attention (Kirch 1988a:4; Terrell 1986). Since isolation is a fundamental condition fostering divergence (Bellwood 1974:278; Cherry 1985:27; Clark and Terrell 1978:307; Green 1968:106; Irwin 1992:200; Kirch 1988b:106; Kirch and Green 1987:440; Terrell 1986), understanding how variations in the degree of interaction between societies have influenced the evolution of human diversity in the Pacific now becomes a fundamental problem that must be examined for each island sequence. Although few would currently believe that once settled, island societies evolved in total isolation (Terrell *et al.* 1997), it is now the challenge of archaeologists to empirically assess conditions which promoted varying levels of interaction, for isolation cannot be "adopted as an assumption to guide research" (Schortman and Urban 1987:81; see also Dalton 1977:204).

Isolation has been considered a "*circumstance of change*" (Irwin 1992:195) and thus not a cause but a condition (Terrell 1986:122). Wide water gaps, as occur increasingly in the eastern Pacific, and rugged terrain (such as valley settings in the Marquesas Islands) do make regular interaction less likely. Additionally, Roger Green (1968:106) has suggested that the geographic barrier of open water between West and East Polynesia "served to maintain the cultural differentiation between them". A similar argument has been advanced for the isolating effect of the 850 to 1000 km water gap between Vanuatu and Fiji, with regard to differentiation between Western and Eastern Lapita (Green 1979, 1982). Kirch has suggested that this

water gap "inhibited regular two-way voyaging contacts and the maintenance of exchange relationships" (1988b:106).

Although isolation is an important factor to consider when assessing island sequences, increasingly it has been documented that the historical development of most island societies was not merely a matter of local process; once settled most, if not all, Pacific islands were 'open systems' for much of their prehistories, as chapters in this volume aptly demonstrate (see also Kirch 1986:33; Rolett 1989:373; Weisler 1994, 1995). It is vital, therefore, to document the relative accessibility and extent of contact between prehistoric island societies to understand the processes of culture change. This can be achieved empirically by documenting external contacts inferred from the frequency, scale and temporal duration of exotic artefacts found throughout island sequences.

On data accumulated thus far for Polynesia, the scale of external exchange activities and volume of material involved have not paralleled that recorded ethnographically, or documented archaeologically (e.g., Allen 1977; Davenport 1962; Irwin 1983; Kirch 1991; Lilley 1986, 1988; see Chapter 2, this volume) for Near Oceania - that is, the islands west of the Solomons (Green 1991; see Fig. 1.1). Nonetheless, the ethnohistoric literature for Polynesia does record instances of long-distance communication between major island groups with some antiquity (Best *et al.* 1992; Kirch 1986).

The best known long-distance (i.e., inter-archipelago) exchange network for Polynesia is in the region of the Ancestral Polynesian Homeland (Davidson 1977, 1978, 1979; Kirch and Green 1987) delimited by the archipelagoes of Fiji, Tonga and Samoa. Colonised by Lapita pottery-bearing populations about 3000 years ago, the region is characterised by a range of island types of greatly varying sizes (high volcanic to low-lying atolls) and by ecological diversity. Indeed, the heterogeneous geological and ecological complexity may have contributed to continuing contact after initial colonisation to distribute vital resources.

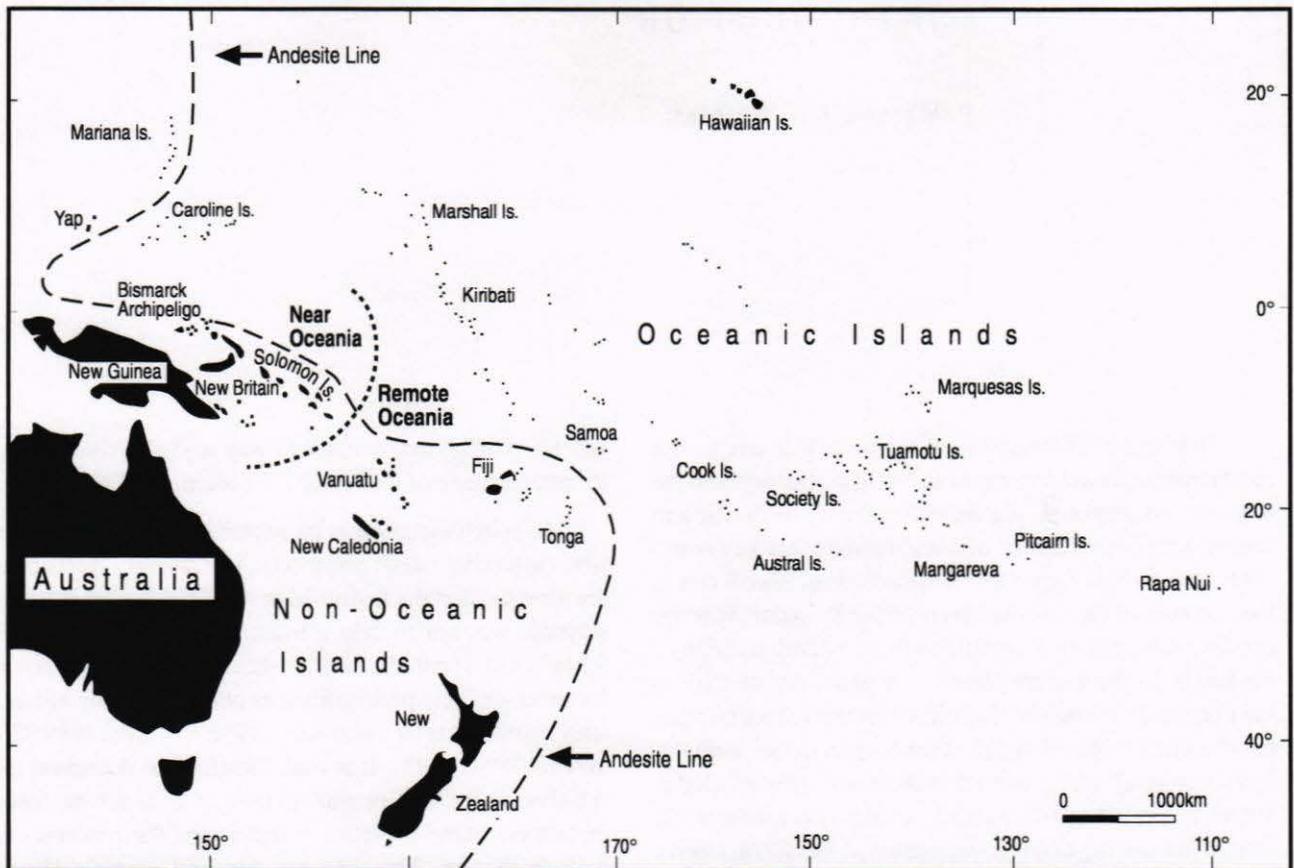


FIGURE 1.1. Map of the Pacific Ocean showing island groups mentioned in this volume, the division between Near and Remote Oceania, and the location of non-oceanic geologically-complex islands (west of the Andesite Line) from those consisting of oceanic island basalt.

But, perhaps of equal importance, contact was maintained with parent communities for marriage partners, cultigens and specialist skills not represented in the founding groups (Kirch 1988b). On this latter point, Irwin (1981) suggests that the lack of potters accompanying founding groups that ventured into eastern Polynesia may have contributed to the demise of pottery making in this region. And Oliver (1989:548) avers that differences in manufacturing specialisation and skill were a stimulus to trade. Additionally, maintaining social ties was also important in recovering from the effects of local drought that limited food production, and after typhoons that destroyed crops and settlements (Halstead and O'Shea 1989). In Samoa, for example, large descent groups would take care of their members after temporary disasters (Mead 1930:65). Even today in the Marshall Islands, relatives will send new planting stock (primarily coconuts, breadfruit and bananas) to atolls devastated by typhoons.

OCEANIA AS A SETTLEMENT LANDSCAPE

Scattered over more than one-third of the earth's surface are thousands of islands displaying a wide range and diversity of landforms, geology, soils, biota, climates, and degrees of isolation, providing endless 'natural experiments' for human colonisation and settlement of the Pacific. Although there are several important biogeographical divisions within the Pacific, I focus here on the Andesite Line as this geological boundary is central to discussions of archaeology and prehistory in the eastern Pacific; that is, Polynesia and eastern Micronesia. The Andesite Line separates the geologically complex non-oceanic islands, such as New Zealand, Fiji, the Solomons, and the Mariana Islands from the relatively homogeneous islands of oceanic basalt which occur in Polynesia and eastern Micronesia (Fig. 1.1; see also, Chapter 4).

Eastward from New Guinea, there is a progressive impoverishment of marine and terrestrial biota, less complex geology, a general diminution of island size, and wider

spacing of landfalls (Green 1991; Kay 1984; Thomas 1965; Thorne 1963:314). This trend is most pronounced east of the Andesite Line, in Polynesia. Here, many island groups (such as Hawaii, Marquesas and the Tuamotus) form linear chains thought to be associated with intraplate volcanism, either at a fixed point or along a linear fissure (Nunn 1994:11). These island chains often demonstrate progressive changes in size and age with distance from the eruptive centre. In the southwest Pacific, some islands are remnants of continental landmasses (e.g., Australia, New Caledonia and New Zealand) or are products of andesitic island arcs with complex geology and soils which have given rise to an enormous diversity of flora, and both marine and terrestrial fauna. Islands are generally much higher, larger, and spaced closer together than their eastern counterparts, thus facilitating continued inter-island voyaging after colonisation (Irwin 1992).

The islands of the Pacific basin are of oceanic island basalt origin which, for the most part, form time-progressive linear chains emanating from relatively stationary hotspots. Unlike the islands to the west, true oceanic islands have marked windward-leeward distinctions and, on average, are smaller than those of the southwest Pacific.

The differences between the western and eastern Pacific (as demarcated by the Andesite Line) have important implications for long-distance inter-island communication. Opportunities for external exchange in Polynesia are limited because of much smaller island size and greater distances between islands. Since relative isolation of an island is related to the distance of its neighbours which influences the frequency of external contacts, we might expect that there would be less voyaging in eastern Polynesia after colonisation than in the west. Wide distances between archipelagoes may be a deterrent to *frequent* contact. This is not to say, however, that voyaging was not an important component in many island societies as will be demonstrated with papers in this volume.

OCEANIC INTERACTION NETWORKS IN ETHNOGRAPHIC PERSPECTIVE

Ethnographic interaction networks can be described in terms of three key variables: (1) *scale*, external or internal to a political or geographic unit; (2) *commodities*, which are either material (e.g., raw materials, tools and food), or intangible goods such as songs, labour, or services of women (Oliver 1989:501); and (3) *context*, i.e., commercial or ceremonial exchange.

The southwest Pacific - encompassing the islands west of the Andesite Line - differed substantially from the rest of Oceania in the "ubiquity and diversity of complex

external exchange systems" (Allen 1984a; Harding 1994; Kirch 1991; Oliver 1989), in the volume of commodities exchanged, and in the organisation of local trade spheres that were intensively integrated into large-scale interaction networks (see Chapter 2). Any student of anthropology should be familiar with Malinowski (1922) and his description of the *kula* ring of the Massim region. Other, equally detailed descriptions of exchange networks include the Siassi of the Vitiaz Strait (Harding 1967), the Hiri of south coastal Papua (Allen 1977, 1984a), and the red-feather 'money' exchange in the Santa Cruz Islands (Davenport 1962, 1964), to name only a few. These exchange networks, in some instances, linked up to 150,000 people from hundreds of communities over hundreds of kilometres (Harding 1967:4). Intensive and large-scale systems incorporating numerous small trade spheres are a hallmark of southwest Pacific exchange networks.

Unlike the diverse and elaborate exchange networks recorded historically in the western Pacific, only one major interaction network is known for the vast region east of the Andesite Line, specifically in the area delimited by the Fiji-Tonga-Samoa archipelagoes (Hjarnø 1979-80; Kaeppeler 1978; Kirch 1984:238-242). Situated at the nexus of this tripartite system, Tonga was considered the most politically complex and geographically expansive of the West Polynesian societies during late prehistory (Goldman 1970; Kirch 1988a:8-13; Sahlins 1958). The exchange of marriage partners between Fiji, Tonga and Samoa provided a context for the transfer of commodities such as canoes, sails, red feathers, decorated barkcloth, mats, stone adzes and pottery.

In eastern Polynesia, descriptions of long-distance interaction networks are rare, with the notable example of 'a mutual exchange of superfluities' between the high volcanic Society Islands and the low coral Tuamotu atolls. Here, the ecological disparity fostered the exchange of Society Island backcloth for Tuamotuan shells and uncommon white dog's hair (Forster 1778:366, quoted in Oliver 1974:1148 n.2). In most cases in East Polynesia, ethnohistoric information on inter-island communication is limited - for the most part - to oral traditions. Although oral traditions record many instances of external contact - both intra-archipelago and between island groups (for a recent treatment see Murdock 1997) - descriptions of exchange systems rivalling those of the southwestern Pacific are lacking.

Our knowledge of interaction systems in Micronesia lies somewhere between those of Melanesia and Polynesia, having parallels in both. Spanning nearly the entire length of Micronesia, the Caroline Islands contain both high volcanic islands and low coral atolls whose ecological contrasts provided a stimulus for trade and interaction. Inter-

atoll and atoll-high island interactions were great as detailed by Ayres *et al.* (Chapter 4). The historically documented *sawei* interaction system between Yap, Ulithi and other central Caroline atolls extended more than 1100 km (Alkire 1965, 1980). While food exchange and distribution were important mechanisms to alleviate the cyclical ravages of tidal waves, storms and drought on low coral islands, ecological differences between volcanic islands and atolls fostered specialisation of production for such items as turmeric, cordage, nets, pigs, turtles, mats, wooden combs, oven stones and the reintroduction of cultigens. Alkire has also suggested that interaction was necessary to transfer navigational lore - considered a source of power and status - to permit success in political maneuverings between Yap and the outer islands of the Central Carolines (Alkire 1980; but see Hunter-Anderson and Zan 1996).

Exchange was regular and institutionalised and took place every few years when canoes from the outer atolls brought tribute in exchange for turmeric and food (Alkire 1965). Exchange between volcanic islands seems to have been limited to the justly famous Yapese limestone 'money' that was quarried on Palau, then transported to Yap more than 329 km distant. Prehistoric antecedents of the *sawei* system involving Yap and numerous atolls are suggested by finds of Yapese pottery on Fais Atoll (Intoh 1996; Intoh and Leach 1985), Ulithi (Craib 1981), and Lamotrek (Fujimura and Alkire 1984). Contacts between Fais Atoll and the Philippines or New Guinea is suggested by the presence of *Dipterocarp* tree gum and stylistic affinities of trolling lures point to a Solomons connection (Intoh 1996:116).

The 29 atolls of the Marshall Islands are spread over nearly two million km² of eastern Micronesia, and a marked rainfall gradient (500 mm annual precipitation in the north to 3000 mm in the far south) produced an ecological disparity that stimulated the manufacture of finished goods in the dry north which were transferred to agriculturally-rich atolls in the south (Finsch 1893). Although few exotic artefacts have been archaeologically documented, extensive intra-archipelago interaction is suggested by the minor dialect differences over this vast region. Indeed, no other single Oceanic language is spoken over such an extensive area (Rehg 1995:321).

The archaeological evidence for long-distance interaction between Pacific islands is based on the identification of *non-perishable* raw materials and finished artefacts foreign to the place of deposition. Importantly, much of the evidence for interaction recorded ethnographically is not archaeologically visible. Figure 1.2 diagrams the ethnohistorically-known interaction network of Fiji, Tonga and Samoa. Note that despite a diverse array

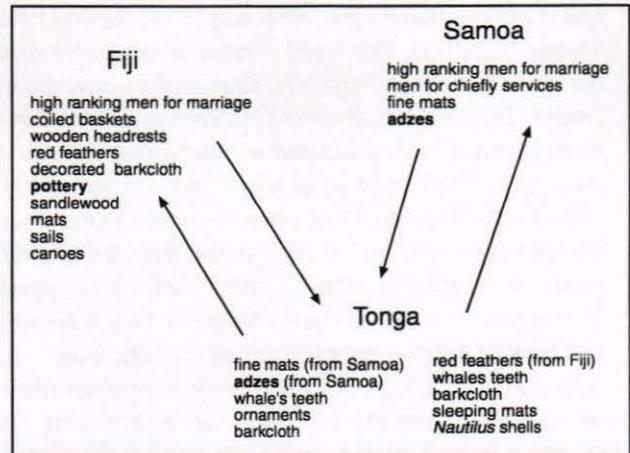


FIGURE 1.2. Material elements of the Fiji-Tonga-Samoa interaction network as known from archaeological, ethnographic and ethnohistoric sources. Only items in bold are routinely recovered from archaeological contexts and can be potentially sourced (after Kaepler 1978; Kirch 1984).

of items in the network, pottery and adzes are among those few commodities that preserve archaeologically and can potentially be identified to a source. Since ethnographic descriptions, such as the Fiji-Tonga-Samoa exchange system, lack deep time depth, we must look to archaeology to provide insight into the full temporal span and evolution of long-distance exchange networks.

ARCHAEOLOGICAL APPROACHES TO EXCHANGE

A fundamental goal of archaeology is to determine the mechanisms or conditions that contribute to social change. The diffusion framework was the first serious coherent body of goals, assumptions and methods for examining the role of inter-societal communication and its effects on local social change (Schortman and Urban 1987:44). By the 1950s, archaeologists assumed that diffusion and migration could account for changes in archaeological sequences. A diffusion framework was proposed by Emory (1968) and Sinoto (1968) for the settlement of Polynesia based on radiocarbon dates, similarities in religious architecture, and in such artefact classes as fishhooks and adzes. Indeed, Sinoto (1983) adopted a diffusionist explanation for presumed homologous similarities in early fishhook and adze styles in Hawaii and the Marquesas. While diffusion is important for providing a source of variability (Dunnell 1980), it is not, of itself, an explanation (Steward and Setzler 1938) and just how much similarity between archaeologically-defined cultures constitutes proof of

diffusion versus independent invention is an open question (Jett 1971). A case in point is the innovation of two-piece fishhooks at the extreme corners of Polynesia: Hawaii, New Zealand and Rapa Nui. Today, one would hardly suggest this is proof of diffusion rather than independent invention or convergent adaptation. That is, these islands lack large black-lipped pearl-shell (*Pinctada margaritifera*) and it seems more likely that innovation of two-piece fishhooks is a convergent adaptation permitting the manufacture of large fishhooks from bone in the absence of black-lipped pearl-shell.

Archaeological interaction studies require the definition of a geographic unit or scale of study. More than 30 years ago, Caldwell introduced the notion of the 'interaction sphere' (Caldwell 1964) with an important premise that local developments took place within an interregional context (Schortman and Urban 1987:46). Studies of Lapita pottery exchange in the southwest Pacific have confirmed this notion repeatedly.

Once the geographic scale of analysis is chosen, a sampling procedure is critical to ensure representativeness of the sites selected for analysis within the region, and to collect representative samples from within sites (Earle and Ericson 1977:5). These samples are vital for determining the spatial patterning of exotic artefacts and the complexity of interaction networks (Plog 1977). Sampling procedures at the regional scale are rare in the Oceanic archaeological literature (but see Weisler 1995), while site-specific analyses are more common.

The archaeological analysis of exchange must be viewed within the larger context of the social system in which it operated. This contextual approach views exchange systems as 'embedded' in the broader system of behaviour incorporating acquisition, production and consumption (Torrence 1986:218). Exchange should be viewed from different perspectives to provide a detailed understanding of its operation (Earle 1982:11). At least for the eastern Pacific, we seem to be at the level of identification where few analyses have examined raw material acquisition, the stage of production, and consumption in a more contextual approach (but see Sheppard 1993).

THEORETICAL APPROACHES TO LONG-DISTANCE INTERACTION IN OCEANIA

Explaining the origin, function and complexity of external interaction networks remains an area of much interest and debate (e.g., Hunt and Graves 1990). I concur with Hirth (1996) and Earle (Chapter 14) that external or long-distance exchange relations are but one aspect of the broader political economy which also includes production,

accumulation and ideological principles. Indeed, as Allen (1984a:411) stated, "the analysis of trade requires the complementary investigation of the social, technological and environmental constraints with which it interacts in any particular situation". Prestige goods exchange networks, according to Friedman (1981), involved status rivalry, marriage exchange and the transfer of valuables through linked ceremonial occasions. This may have been especially true for the historically-recorded inter-archipelago exchange network linking Fiji, Tonga and Samoa (Kaeppeler 1978). Here, the exchange of marriage partners provided a context for the transfer of such objects as stone adzes and pottery. Yet, predominantly food and utilitarian goods exchanges provided an opportunity to demonstrate prowess in trading - an important mechanism in the acquisition of status (Allen 1984a:428).

Gosden suggests the role of interaction and social complexity is understood best from a 'debt' model where interaction is influenced by the need to obtain gifts, impose and wipe out debts, and provide some stability in social relations (1989:51, 52). Exchange of valued items and differential access to commodities may also have strengthened and centralised political control of elites and contributed towards sociopolitical hierarchy (Earle 1987). In a similar vein, Anderson (1996), following Groube (1971), believes that expansion into the uninhabited islands of East Polynesia was fuelled by competition to reach anticipated reserves of unowned and prestigious commodities. These same events could also have been prompted by expulsion of groups defeated in war, resettlement of populations from densely inhabited regions, or motivated by simple exploration for new lands.

The rapid spread of the Lapita colonisers - a phenomenon unparalleled in world prehistory - may have resulted from two main circumstances. The first is the maintenance of long-distance prestige goods networks (more akin to networks in Near Oceania) and, secondly, the selective advantage of continued access to parent communities by the colonisers assured a 'lifeline' that increased successful colonisation (Kirch 1988b; Sheppard 1993). As suggested three decades ago by Alkire (1965), and more recently by (Kirch 1988b; Hunter-Anderson and Zan 1996), exchange could have played an important adaptive role by linking small, isolated communities to larger, more diverse and stable communities. As demonstrated recently (Weisler 1994, 1995), small isolated communities such as those typified by Henderson Island, in southeast Polynesia, were, indeed, linked to larger communities in a regional interaction network. Once inter-archipelago voyaging ceased, extinction of isolated human populations followed (Chapter 9).

The process of culture change on Pacific islands has garnered most explanatory value through an isolation and interaction model which was developed for the Fiji-Tonga-Samoa region two decades ago (Davidson 1977, 1978). Kirch and Green (1987), Kirch (1988a), Irwin (1992), Rolett (1993) and Weisler (1994, 1995) have continued to demonstrate its efficacy. The isolation and interaction model assumes that continued contact is inferred from similarities in material culture, while divergence is a response to a cessation of external interaction. The end of voyaging in East Polynesia about A.D. 1500 resulted in marked changes in material culture in the Cook Islands, the Marquesas and islands in southeast Polynesia. The latter region clearly demonstrates widespread use of imported artefacts and raw materials during the period of inter-archipelago voyaging, while the exclusive use of artefacts manufactured from locally-available resources occurred only after long-distance communication ceased (Chapter 9). This model is clearly applicable to island groups within Polynesia, as papers in this volume demonstrate.

SUMMARY

It is no coincidence that the exchange systems of the southwestern Pacific are, to date, the best described ethnographically and archaeologically for the whole of Oceania. Ethnographers found the ubiquity and diversity of Melanesian exchange systems fertile ground for plying their craft and have produced a wealth of descriptive tomes (e.g., Davenport 1962, 1964; Dutton 1982; Harding 1967; Malinowski 1922). Archaeologists were later to demonstrate the antiquity and historical development of some of these systems (e.g., Allen 1977, 1984a; Irwin 1983, 1985; Lilley 1986; Rhoads 1982) and long-distance exchange has been archaeologically documented throughout the southwestern Pacific between various Lapita sites (see references in Kirch and Hunt 1988; Kirch 1997). Summerhayes and Allen (1993; Allen 1984b), sourcing obsidian, have also demonstrated that some form of interaction took place during the late Pleistocene in the Bismarck Archipelago.

Inter-locking Lapita communities have been linked over networks up to 3400 km. The scale and complexity of these networks significantly exceeded any of the classic interaction networks ethnographically documented for Oceania. In the eastern Pacific, documenting exchange relationships will be more difficult than in the west as the archaeological signatures of interaction - as modelled after the data for the southwest Pacific - are generally lacking for the eastern Pacific islands (Table 1.1).

As in the western Pacific, archaeological evidence has documented long-distance communication between West

Polynesia (perhaps Fiji) and the Marquesas (Dickinson and Shutler 1974); Tonga and the Cook Islands (Walter and Dickinson 1989); between Samoa and Fiji, Taumako, Tokelau and the Cook Islands (Best *et al.* 1992; Weisler and Kirch 1996); between Mangareva and the Pitcairn group (Weisler 1993b, 1994; Chapter 9); and numerous instances of intra-archipelago movement of commodities in Tonga (Kirch 1988a), the Pitcairn Islands (Weisler 1995), Hawaii (Weisler 1990; Weisler and Clague 1997; Chapter 10), and New Zealand (Davidson 1981, 1984). Considering that the very artefact and material classes that define long-distance interaction in the southwestern Pacific (i.e., large quantities of obsidian, pottery and shell valuables) are limited or absent in the eastern Pacific, the archaeological evidence for external interaction in Polynesian is remarkable.

Perhaps first attracted by the rich ethnohistoric literature and the 'ethnographic present' of traditional cultures in Near Oceania, archaeologists have focussed much effort in tracing the historical antecedents of those systems. As papers in this volume will demonstrate, understanding the complexity and spatial and temporal dimensions of prehistoric Polynesian and Micronesian interaction networks - the transformation of Lapita interaction systems in Remote Oceania - should go forward with as much enthusiasm as we have expended investigating their counterparts in the southwest Pacific.

BACKGROUND TO THIS VOLUME

In 1980 I had the good fortune to direct an intensive survey and excavation programme focussed on a late prehistoric settlement pattern in leeward Moloka'i, Hawaiian Islands. During the course of the survey, about a dozen residential complexes were identified which were marked by various configurations of dry-laid stone masonry, scatters of food remains, basalt debitage and other artefacts. The presence of exotic basalt artefacts was one measure used to differentiate the relative status of the occupants of these former households (Weisler and Kirch 1985:142). And so began my exploration into determining the provenance of fine-grained basalt artefacts in dated habitation sites in Polynesia. Simon Best, then working on his Ph.D. research at the University of Auckland, was also actively pursuing sourcing studies at this time (Best 1984, *et al.* 1992; Chapter 12). While I was collaborating with a group of colleagues at the Bernice P. Bishop Museum in Honolulu and the University of Hawaii on the petrographic characteristics of the Hawaiian adze quarries (Cleghorn *et al.* 1985), Best (1984) was experimenting with x-ray fluorescence analysis (XRF) (see also Chapter 12 for a history of geochemical research at the University of Auckland). Realising that

Data/artefacts	Western Pacific	Polynesia
Ethnohistoric sources	abundant	limited
Pottery	abundant	limited
Obsidian	abundant	limited
Shell valuables	present	absent
Chert & chalcedony	limited	limited
Volcanic oven stones	limited	limited
Volcanic glass	limited	limited

Note: Volcanic glass refers to dyke deposits normally of inferior quality to obsidian. For artefact classes: abundant = relatively common in sites; limited = rare or encountered in low quantities.

TABLE 1.1. Evidence for long-distance interaction in Oceania.

petrographic sourcing studies were limited in widespread applicability (Weisler 1993a:71), I began to experiment with various techniques of XRF such as wavelength and energy-dispersive analysis (Weisler 1989, 1993c). Various sample preparation protocols were used from fusing artefact samples into glass beads, crushing and pressing specimens into disks, to simple washing in distilled water and analysing whole artefacts. It soon became apparent that not only did sample preparation protocols vary widely, but specific operating conditions of XRF equipment between laboratories could produce incompatible results. Indeed, there was an urgent need to gather together those that were working on Polynesian sourcing issues.

In January, 1993 John Sinton and I organised a workshop entitled "The Provenance of Polynesian Basalt Artefacts" held at the University of Hawaii at Mānoa. This workshop brought together many researchers including those from the University of California at Berkeley (Weisler), Bishop Museum, Honolulu (Allen and Johnson), University of Hawaii (Rolett, Sinton, Pearthree) and the University of Auckland (Sheppard) for a day-long discussion on mutual problems and summaries of current research. The following year I organised the symposium, "Prehistoric Long-distance Interaction in Oceania" held at the annual meeting of the Society for American Archaeology in Los Angeles. The core of this volume is an outgrowth of that symposium. That this effort is truly interdisciplinary is evident by the participation of six geologists who co-authored nine of the 14 chapters.

This volume is primarily about the contribution of basalt sourcing studies to understanding prehistoric interaction in Remote Oceania. We do not consider in depth the value of linguistic research, oral traditions, homologous

similarities identified in fishhook, adze and architectural styles, nor recent mtDNA studies and physical anthropology - all of which can add towards understanding prehistoric interaction in the region. I believe that tracking the scale, frequency and duration of imported artefacts is the single best measure for defining prehistoric interaction. I view these other studies as supplemental and useful for defining the gross parameters of interaction, but it is unlikely that they will ever supply the fine details provided by the geochemical analysis of basalt artefacts from dated contexts.

Least it be overlooked, the word 'interaction' was specifically used in the title of this volume to denote some form of intergroup communication, instead of the ethnographically charged terms 'trade' and 'exchange'. The two-way movement of exotic artefacts - the necessary and sufficient conditions of trade or exchange - is usually assumed and less often documented in archaeological contexts. Perhaps it is sufficient to identify the movement of exotic goods within a specific 'interaction sphere'.

VOLUME CONTENTS

This volume is meant to be accessible to those with little or no familiarity with geochemical characterisation techniques such as XRF, and also to others who have not delved deeply into the Pacific archaeological literature. Consequently, after this introductory essay, the volume continues with Chapter 2 by Green and Kirch who summarise the issues in exchange and interaction studies in Melanesia or Near and western Remote Oceania (after Green 1991; see Fig. 1.1). Many theoretical and methodological issues have developed from the analysis of Lapita, a horizon commonly defined by its highly stylised

dentate-stamped pottery and the long-distance transfer of obsidian and other exotics (Green 1979; Kirch 1997). Green and Kirch demonstrate how Lapita was the precursor to interaction networks in Remote Oceania (Polynesia and Micronesia) and, as such, plays a pivotal role in understanding the evolution and transformation of interaction networks in Remote Oceania.

During the 18th century early explorers into Polynesia, among the most notable, James Cook, were surprised to find that the 'Indians of the Pacific' spoke related languages and told of repeated voyages to distant lands. Finney, in Chapter 3, reviews these early accounts that continue to foster anthropological debates nearly two centuries later. Since 1975, Finney and colleagues (e.g., Finney 1994) have accumulated a vast amount of experimental voyaging data aboard the double-hulled vessel *Hōkūle'a*. Details on canoe performance, seamanship and rekindled techniques of traditional navigation demonstrate how experimental voyaging research has shaped our ideas about prehistoric interaction in the eastern Pacific.

Part II of the volume contains six case studies. Micronesia is a long-neglected area of the Pacific, and more archaeological projects - both contract-funded and those initiated solely by research interests (reviewed recently by Kirch and Weisler 1994; Rainbird 1994) - are beginning to increase our understanding of prehistoric interaction in this region. Ayres, Goles and Beardsley (Chapter 4) review the potential for Micronesian exchange studies and describe their geochemical analysis of the building stones used to construct the famous monumental complex at Nan Madol - the seat of a far-ranging chiefdom. They outline an important methodological consideration for Micronesian provenance studies. That is, levels of interaction must be viewed from the perspective of high island-atoll transfers, between high islands, and extra-Micronesian contact. In addition to these geographic distinctions, documenting interaction between atolls is another level that may require greater recourse to oral traditions, historically recorded accidental voyages (e.g., Riesenbergh 1965), ethnographies, and language distributions for insight into prehistoric communication.

Beginning in West Polynesia and ending in the remote corners of East Polynesia, five case studies examine prehistoric interaction in Samoa, the Cook Islands, the Marquesas and southeast Polynesia (Mangareva and the Pitcairn group). Clark, Wright and Herdrich in Chapter 5 summarise archaeological and geochemical studies of fine-grained basalt from quarries and exploitation sites in Samoa, an archipelago critically important for understanding the prehistory of central Polynesia. Many important basalt sources exist on Tutuila island and, consequently, we need to look at the geochemical variability of all these sources

before assigning exotic artefacts to specific sources. (Pb isotopes studies of Tutuila basalt sources are currently underway by M. Weisler and J. Woodhead.) They conclude that much more work needs to be done for understanding the chronology of basalt use at various Tutuila island sources - of great interest since Tutuila basalt has been found over 1200 km distant in the Cooks (Walter and Sheppard 1996; Weisler and Kirch 1996; Chapters 6 and 7) and other island groups (Best *et al.* 1992).

The initial steps for a sourcing programme for any island group are exemplified by a case study from the Cook Islands by Sheppard, Walter and Parker (Chapter 6). Potential source rock is collected from most of the Cook Islands and then museum collections are analysed to understand the geochemical variability of artefact basalt. Using collected samples and published geologic data, sources are assigned for analysed museum artefacts. Both artefact transfer within the southern Cooks and interaction with Samoa and the Societies is suggested; however, understanding the development of exchange systems must await further field investigations where additional well-provenanced exotic artefacts can be obtained from dated contexts. In Chapter 7, Allen and Johnson describe further work in the Cook Islands by focusing on the changing diversity and abundance of imports to Aitutaki island. They too document contacts with Samoa and possibly the Society Islands, while presenting evidence for interaction long after initial settlement. Allen and Johnson suggest that continued exchange may have buffered this relatively small island against risks (Kirch 1988b), a situation repeated for the ecologically-marginal Henderson Island in the Pitcairn group (Weisler 1994; Chapter 9).

Typifying the remote and isolated island group, Rolett, Conte, Pearthree and Sinton (Chapter 8) present the first archaeometric evidence for prehistoric inter-island voyaging for the Marquesas Islands. Beyond documenting patterns of prehistoric interaction, geochemical studies elucidate the relationship between raw material availability and lithic technology. For example, all imported high-quality fine-grained basalt was fashioned into formal tools, while expedient flake tools were manufactured from locally-available coarse-grained rocks. This situation has been noted for Samoa (Weisler 1993c:182-183) and may well serve as an important model for other East Polynesian island groups.

In Chapter 9, I examine a range of exotic artefacts including fine-grained basalt adze material, vesicular basalt oven stones, volcanic glass, black-lipped pearl-shell, imported cultigens (e.g., leaves of banana, swamp taro and *Cordyline*), bones of the introduced commensal Pacific rat (*Rattus exulans*) and the domestic pig (*Sus scrofa*) for a comprehensive examination of interaction between

Mangareva and the Pitcairn group. The first two-way movement of commodities in Polynesia is documented for the Mangareva-Pitcairn interaction sphere. After a period of about 400 years of inter-island interaction, marked changes in material culture are identified on Henderson Island after the cessation of inter-island voyaging.

Most would agree that the geochemical analysis of exotic basalt artefacts found in distant and dated habitation sites provides the best evidence for determining the scale, frequency and temporal dimensions of long-distance interaction in the eastern Pacific. The generation and interpretation of geochemical data are the cornerstones of all case studies presented in this volume. When Lapita colonisers crossed the Andesite Line, which separates islands composed of continental and andesitic rocks from oceanic island basalts found primarily in Polynesia, the geologic diversity changed from complex to relatively simple. Yet, the oceanic island basalts of Polynesia posed new problems for regional provenance studies. Part III is devoted to technical papers. Weisler and Sinton (Chapter 10) provide the geological background to provenance studies in Polynesia and describe how the XRF technique works. The geochemical data for Polynesian quarries are summarised and an important distinction is made between 'quarries' and 'sources'. A protocol for sourcing Polynesian volcanic artefacts is offered and future directions in compositional studies are outlined. Documenting the geochemical variability of sources, comprehensive field sampling of basalt quarries and standardised data reporting are needed.

As large geochemical databases are fast accumulating, there is an urgent need for standardised reporting of analytical protocols and equipment used as well as the exchange of standards for determining the accuracy and precision of various laboratories (Weisler 1993a:75-76). Sinton and Sinoto (Chapter 11) report on the University of Hawaii's database which contains 280 individual geochemical analyses of artefacts and source rocks. Despite the reporting of geochemical data for 36 Polynesian quarries, documenting intra-quarry geochemical variability is a high priority. To this end, detailed quarry sampling is urgently needed for most locales.

Since analytical techniques can vary between laboratories rendering inter-lab comparisons problematic, Parker and Sheppard (Chapter 12) address this important issue by describing the procedures used in accumulating the large geochemical database at the University of Auckland. They outline the history of provenance studies at their laboratory during the past 15 years.

In Chapter 13, Woodhead and Weisler examine the technical advancement in the characterisation of source rock

and identification of exotic artefacts using the highly accurate lead isotope technique (Weisler and Woodhead 1995). Assigning artefacts to a specific source can be problematic in certain areas of Polynesia where there is significant geochemical source overlap. These regions include the southern Cook Islands and within Tutuila island. The lead isotope technique may be the answer for fine-scale characterisations and sourcing problematic specimens.

In Part IV, Earle, concludes the volume by placing Oceanic interaction studies in the larger world-wide arena. Following the premise that exchange relationships are embedded in larger social institutions, Earle believes that determining the nature of the political economy is essential for understanding the different outcomes of prehistoric interaction that developed in Near and Remote Oceania. Archaeology - with its ability to address long-term change - is aptly poised to document and provide insights into understanding the marked variability and significance of prehistoric interaction spheres found throughout Oceania. What caused the ethnographically-recorded Hiri of south coastal Papua to travel great distances in oftentimes hazardous seas to trade thousands of earthenware pots for many metric tonnes of sago flour? Yet, in contrast, the relatively meagre archaeological evidence for long-distance interaction in the eastern Pacific (perhaps signalling a de-emphasis of exchange) is identified primarily by exotic adze material moved in some instances up to 1200 km; that is, from Samoa to the Cook Islands. Earle asks, Did substantial local specialisations develop within the subsistence economy of Remote Oceania? Why was exchange comparatively limited in scale through eastern Polynesia? These are questions that can be addressed by archaeological data - the kind presented in this volume. In concluding, Earle outlines some provocative questions for future research.

Conventions

In assigning diacritical marks to Hawaiian placenames I have followed Pukui *et al.* (1974) and have differentiated the archipelago Hawaii, from the island of Hawai'i by retention of the glottal in the latter. Cook Island placenames are as they appear in common local usage. In all other examples I have followed the suggestions of the authors.

ACKNOWLEDGEMENTS

I thank Roger Green and Patrick Kirch for comments on a previous version of this chapter and Martin Fisher for re-drafting the figures.

REFERENCES

- Alkire, W. 1965. Lamotrek Atoll and Inter-Island Socio-Economic Ties. *Illinois Studies in Anthropology* No. 5. Urbana, Illinois.
- Alkire, W. 1980. Technical knowledge and the evolution of political systems in the central and western Caroline Islands of Micronesia. *Canadian Journal of Anthropology* 1:229-237.
- Allen, J. 1977. Sea traffic, trade and expanding horizons. In J. Allen, J. Golson, and R. Jones (eds), *Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia and Australia*, pp. 387-417. London, Academic Press.
- Allen, J. 1984a. Pots and poor princes: a multidimensional approach to the role of pottery trading in coastal Papua. In S. E. van der Leeuw and A. Pritchard (eds), *The Many Dimensions of Pottery: Ceramics in Archaeology and Anthropology*, pp. 407-463. Amsterdam, Instituut Voor Prae-en Protohistorie.
- Allen, J. 1984b. In search of the Lapita homeland. *Journal of Pacific History* 19:186-201.
- Anderson, A. 1996. Adaptive voyaging and subsistence strategies in the early settlement of East Polynesia. In T. Akazawa and E.J.E. Szathmáry (eds), *Prehistoric Mongoloid Dispersals*, pp. 359-373. Oxford, Oxford University Press.
- Bellwood, P. 1974. Prehistoric contacts in the Cook Islands. *Mankind* 9:278-280.
- Best, S. 1984. Lakeba: the Prehistory of a Fijian Island. Ph.D. thesis, University of Auckland, Auckland.
- Best, S., P. Sheppard, R.C. Green and R. Parker. 1992. Necromancing the stone: archaeologists and adzes in Samoa. *Journal of the Polynesian Society* 101:45-85.
- Caldwell, J. 1964. Interaction spheres in prehistory. In J. Caldwell and R. Hall (eds), *Hopewellian Studies*, pp. 134-143. *Illinois State Museum Scientific Papers* 12. Springfield.
- Cherry, J.F. 1985. Islands out of the stream: isolation and interaction in early East Mediterranean insular prehistory. In A.B. Knapp and T. Stech (eds), *Prehistoric Production and Exchange: The Aegean and Eastern Mediterranean*, pp. 12-29. *Institute of Archaeology, University of California, Los Angeles*, Monograph 25.
- Clark, J. and J. Terrell. 1978. Archaeology in Oceania. *Annual Review of Anthropology* 7:293-319.
- Cleghorn, P., T. Dye, M. Weisler and J. Sinton. 1985. A preliminary petrographic study of Hawaiian stone adze quarries. *Journal of the Polynesian Society* 94:235-251.
- Craib, J.L. 1981. Settlement on Ulithi atoll, Western Caroline Islands. *Asian Perspectives* 24:47-55.
- Dalton, G. 1977. Aboriginal economies in stateless societies. In T.K. Earle and J.E. Ericson (eds), *Exchange Systems in Prehistory*, pp. 191-212. New York, Academic Press.
- Davenport, W.H. 1962. Red feather money. *Scientific American* 206:94-103.
- Davenport, W.H. 1964. Notes on Santa Cruz voyaging. *Journal of the Polynesian Society* 73:134-142.
- Davidson, J.M. 1977. Western Polynesia and Fiji: prehistoric contact, diffusion and differentiation in adjacent archipelagos. *World Archaeology* 9: 82-94.
- Davidson, J.M. 1978. Western Polynesia and Fiji: the archaeological evidence. *Mankind* 11:383-390.
- Davidson, J.M. 1979. Samoa and Tonga. In J. Jennings (ed.), *The Prehistory of Polynesia*, pp. 82-109. Cambridge, Harvard University Press.
- Davidson, J.M. 1981. The prehistoric exploitation of stone resources in northern New Zealand. In F. Leach and J. Davidson (eds), *Archaeological Studies of Pacific Stone Resources*, pp. 107-119. *BAR International Series* 104. Oxford.
- Davidson, J.M. 1984. *The Prehistory of New Zealand*. Auckland, Longman Paul.
- Dickinson, W. and R. Shutler. 1974. Probable Fijian origin of quartzose temper sands in prehistoric pottery from Tonga and the Marquesas. *Science* 185:454-457.
- Dunnell, R. 1980. Evolutionary theory and archaeology. *Advances in Archaeological Method and Theory* 3:35-99.
- Dutton, J. W. 1982. *The Hiri in History: Further Aspects of Long-distance Motu Trade in Central Papua*. Canberra, Research School of Pacific Studies, Australian National University.
- Earle, T.K. 1982. Prehistoric economics and the archaeology of exchange. In J.E. Ericson and T.K. Earle (eds), *Contexts for Prehistoric Exchange*, pp. 1-12. New York, Academic Press.
- Earle, T.K. 1987. Specialization and the production of wealth: Hawaiian chiefdoms and the Inka empire. In T.K. Earle and E.M. Brumfiel (eds), *Specialization, Exchange, and Complex Societies*, pp. 64-75. Cambridge, Cambridge University Press.
- Earle, T.K. and J.E. Ericson. 1977. Exchange systems in archaeological perspective. In T.K. Earle and J.E. Ericson (eds), *Exchange Systems in Prehistory*, pp. 3-12. New York, Academic Press.
- Emory, K. 1968. East Polynesian relationships as revealed through adzes. In I. Yawata and Y. Sinoto (eds), *Prehistoric Culture in Oceania, A Symposium*, pp. 151-169. Honolulu, Bishop Museum Press.
- Finney, B. 1994. *Voyage of Rediscovery*. Berkeley, University of California Press.
- Finsch, O. 1893. Ethnologische Erfahrungen und Belegstücke aus des Südsee. Dritte Abtheilung: Mikronesien (West-Oceanien). II. Marshall-Archipel. *Annalen des K. K. Naturhistorischen Hofmuseums* pp. 119-182.
- Fujimura, K. and W.R. Alkire. 1984. Archaeological investigations on Faraulep, Woleai, and Lamotrek. In Y. Sinoto (ed.), *Caroline Islands Archaeology: Investigations on Fefan, Faraulep, Woleai and Lamotrek*, pp. 65-149. *Pacific Anthropological Records* 35. Honolulu, Bernice P. Bishop Museum.
- Goldman, I. 1970. *Ancient Polynesian Society*. Chicago, University of Chicago Press.
- Gosden, C. 1989. Prehistoric social landscapes of the Arawe Islands, West New Britain province, Papua New Guinea. *Archaeology in Oceania* 24:445-58.
- Green, R.C. 1968. West Polynesian prehistory. In I. Yawata and Y. H. Sinoto (eds), *Prehistoric Culture in Oceania, A Symposium*, pp. 99-109. Honolulu, Bishop Museum Press.
- Green, R.C. 1979. Lapita. In J. Jennings (ed.), *The Prehistory of Polynesia*, pp. 27-60. Cambridge, Harvard University Press.
- Green, R.C. 1982. Models for the Lapita cultural complex: an evaluation of some current proposals. *New Zealand Journal of Archaeology* 4:7-19.

- Green, R.C. 1991. Near and Remote Oceania: disestablishing "Melanesia" in culture history. In A. Pawley (ed.), *Man and a Half: Essays in Pacific Anthropology and Ethnobiology in Honour of Ralph Bulmer*, pp. 491-502. Auckland, The Polynesian Society.
- Groube, L. 1971. Tonga, Lapita pottery, and Polynesian origins. *Journal of the Polynesian Society* 80:278-316.
- Halstead, P. and J. O'Shea (eds). 1989. *Bad Year Economics*. Cambridge, Cambridge University Press.
- Harding, T.G. 1967. *Voyagers of the Vitiaz Strait: A Study of a New Guinea Trade System*. Seattle, University of Washington Press.
- Harding, T.G. 1994. Precolonial New Guinea trade. *Ethnology* 33:101-125.
- Hirth, K.G. 1996. Political economy and archaeology: perspectives on exchange and production. *Journal of Archaeological Research* 4:203-239.
- Hjarnø, J. 1979-80. Social reproduction: towards an understanding of aboriginal Samoa. *Folk* 21-22:73-123.
- Hunt, T.L. and M.W. Graves. 1990. Some methodological issues of exchange in Oceanic prehistory. *Asian Perspectives* 29:107-117.
- Hunter-Anderson, R.L. and Y. Zan. 1996. Demystifying the sawei, a traditional interisland exchange system. *ISLA: A Journal of Micronesian Studies* 4:1-45.
- Intoh, M. 1996. Multi-regional contacts of prehistoric Fais islanders in Micronesia. *Bulletin of the Indo-Pacific Prehistory Association* 15:111-117.
- Intoh, M. and F. Leach. 1985. Archaeological Investigations in the Yap Islands, Micronesia: First Millennium B. C. to the Present Day. *British Archaeological Reports* S277. Oxford.
- Irwin, G. 1981. How Lapita lost its pots: the question of continuity in the colonisation of Polynesia. *Journal of the Polynesian Society* 90:481-494.
- Irwin, G. 1983. Chieftainship, kula and trade in Massim prehistory. In J.W. Leach and E. Leach (eds), *The Kula: New Perspectives on Massim Exchange*, pp. 29-72. Cambridge, Cambridge University Press.
- Irwin, G. 1985. The Emergence of Mailu as a Central Place in Coastal Papuan Prehistory. *Terra Australis* 10. Canberra, Department of Prehistory, Research School of Pacific Studies, Australian National University.
- Irwin, G. 1992. *The Prehistoric Exploration and Colonisation of the Pacific*. Cambridge, Cambridge University Press.
- Jett, S.C. 1971. Diffusion versus independent development: the bases of controversy. In C.L. Riley, J.C. Kelley, C.W. Pennington and R.L. Rands (eds), *Man Across the Sea: Problems of Pre-Columbian Contacts*, pp. 5-53. Austin, University of Texas Press.
- Kay, E. 1984. Patterns of speciation in the Indo-West Pacific. In F.J. Radvosky, P.H. Raven, and S.H. Sohmer (eds), *Biogeography of the Tropical Pacific: Proceedings of a Symposium*, pp. 15-31. *Bernice P. Bishop Museum Special Publication* 72. Honolulu.
- Kaeppler, A.L. 1978. Exchange patterns in goods and spouses: Fiji, Tonga and Samoa. *Mankind* 11:246-252.
- Kirch, P.V. 1984. *The Evolution of the Polynesian Chiefdoms*. Cambridge, Cambridge University Press.
- Kirch, P.V. 1986. Exchange systems and inter-island contact in the transformation of an island society: the Tikopia case. In P. Kirch (ed.), *Island Societies: Archaeological Approaches to Evolution and Transformation*, pp. 33-41. Cambridge, Cambridge University Press.
- Kirch, P.V. 1988a. Niuaotupapu, The Prehistory of a Polynesian Chiefdom. *Thomas Burke Memorial Washington State Museum Monograph* 5. Seattle.
- Kirch, P.V. 1988b. Long-distance exchange and island colonization: the Lapita case. *Norwegian Archaeological Review* 21:103-117.
- Kirch, P.V. 1991. Prehistoric exchange in Western Melanesia. *Annual Review of Anthropology* 20:141-165.
- Kirch, P.V. 1997. *The Lapita Peoples, Ancestors of the Oceanic World*. Cambridge, Mass., Blackwell.
- Kirch, P.V. and R.C. Green. 1987. History, phylogeny, and evolution in Polynesia. *Current Anthropology* 28:431-456.
- Kirch, P.V. and T.L. Hunt (eds). 1988. Archaeology of the Lapita Cultural Complex: A Critical Review. *Thomas Burke Memorial Washington State Museum Research Report* 5. Seattle.
- Kirch, P.V. and M.I. Weisler. 1994. Archaeology in the Pacific Islands: an appraisal of recent research. *Journal of Archaeological Research* 2:285-328.
- Lilley, I. 1986. Prehistoric Exchange in the Vitiaz Strait, Papua New Guinea. Ph.D. thesis, Australian National University, Canberra.
- Lilley, I. 1988. Prehistoric exchange across the Vitiaz Strait, Papua New Guinea. *Current Anthropology* 29:513-516.
- Malinowski, B. 1922. *Argonauts of the Western Pacific*. London, Routledge and Kegan Paul.
- Mead, M. 1930. Social Organization of Manua. *Bernice P. Bishop Museum Bulletin* 76. Honolulu.
- Murdock, K. 1997. An Ethnohistory of Polynesian Voyaging. M.A. thesis, University of Otago.
- Nunn, P. 1994. *Oceanic Islands*. Oxford, Blackwell.
- Oliver, D. 1974. *Ancient Tahitian Society*. 3 volumes. Honolulu, University of Hawaii Press.
- Oliver, D. 1989. *Oceania: The Native Cultures of Australia and the Pacific Islands*. 2 volumes. Honolulu, University of Hawaii Press.
- Plog, F. 1977. Modeling economic exchange. In T.K. Earle and J.E. Ericson (eds), *Exchange Systems in Prehistory*, pp. 127-140. New York, Academic Press.
- Pukui, M.K., S.H. Elbert and E.T. Mookini. 1974. *Place Names of Hawaii*. Second edition. Honolulu, University of Hawaii Press.
- Rainbird, P. 1994. Prehistory in the northwest tropical Pacific: the Caroline, Mariana, and Marshall Islands. *Journal of World Prehistory* 8:293-349.
- Rehg, K.L. 1995. The significance of linguistic interaction spheres in reconstructing Micronesian prehistory. *Oceanic Linguistics* 34:305-326.
- Rhoads, J.W. 1982. Prehistoric Papuan exchange systems: the Hiri and its antecedents. In T. Dutton (ed.), *The Hiri in History: Further Aspects of Long-distance Motu Trade in Central Papua*, pp. 131-151. Canberra, Research School of Pacific Studies, Australian National University.
- Riesenberg, S.H. 1965. Table of voyages affecting Micronesian islands. *Oceania* 36:155-170.
- Rolett, B. 1989. Hanamiai: Changing Subsistence and Ecology in the Prehistory of Tahuata (Marquesas Islands, French Polynesia). Ph.D. thesis, Yale University, New Haven, CT.
- Sahlins, M. 1958. *Social Stratification in Polynesia*. Seattle, University of Washington Press.

- Schortman, E. and P. Urban. 1987. Modeling interregional interaction in prehistory. *Advances in Archaeological Method and Theory* 11:37-95.
- Sheppard, P.J. 1993. Lapita lithics: trade/exchange and technology. A view from the Reefs/Santa Cruz. *Archaeology in Oceania* 28:121-137.
- Sinoto, Y. 1968. Position of the Marquesas Islands in East Polynesian prehistory. In I. Yawata and Y. Sinoto (eds), *Prehistoric Culture in Oceania, A Symposium*, pp. 111-118. Honolulu, Bishop Museum Press.
- Sinoto, Y. 1983. An analysis of Polynesian migrations based on the archaeological assessments. *Journal de la Société des Océanistes* 76:57-67.
- Steward, J.H. and F.M. Setzler. 1938. Function and configuration in archaeology. *American Antiquity* 4:4-10.
- Summerhayes, G.R. and J. Allen. 1993. The transport of Mopir obsidian to Late Pleistocene New Ireland. *Archaeology in Oceania* 28:144-148.
- Terrell, J. 1986. *Prehistory in the Pacific Islands*. Cambridge, Cambridge University Press.
- Terrell, J., T.L. Hunt, and C. Gosden. 1997. The dimensions of social life in the Pacific: human diversity and the myth of the primitive isolate. *Current Anthropology* 38:155-195.
- Thomas, W. 1965. The variety of physical environments among Pacific islands. In F. R. Fosberg (ed.), *Man's Place in the Island Ecosystem: A Symposium*, pp. 7-37. Honolulu, Bishop Museum Press.
- Thorne, R. 1963. Biotic distribution patterns in the tropical Pacific. In J.L. Gressitt (ed.), *Pacific Basin Biogeography: A Symposium*, pp. 311-350. Honolulu, Bishop Museum Press.
- Torrence, R. 1986. *Production and Exchange of Stone Tools: Prehistoric Obsidian in the Aegean*. Cambridge, Cambridge University Press.
- Walter, R. and W. Dickinson. 1989. A ceramic sherd from Ma'u'uke in the Southern Cook Islands. *Journal of the Polynesian Society* 98:465-470.
- Walter, R. and P.J. Sheppard. 1996. The Ngati Tiare adze cache: further evidence of prehistoric contact between West Polynesia and the Southern Cook Islands. *Archaeology in Oceania* 31:33-39.
- Weisler, M.I. 1989. Towards documenting exchange in a complex chiefdom: an essay in method. Paper presented at the 54th annual meeting of the Society for American Archaeology, Atlanta, Georgia.
- Weisler, M.I. 1990. Sources and sourcing of volcanic glass in Hawai'i: implications for exchange studies. *Archaeology in Oceania* 25:16-23.
- Weisler, M.I. 1993a. Provenance studies of Polynesian basalt adze material: a review and suggestions for improving regional data bases. *Asian Perspectives* 32:61-83.
- Weisler, M.I. 1993b. Long-distance Interaction in Prehistoric Polynesia: Three Case Studies. Ph.D. thesis, University of California, Berkeley.
- Weisler, M.I. 1993c. Chemical characterization and provenance of Manu'a adz material using a non-destructive x-ray fluorescence technique. In P.V. Kirch and T.L. Hunt (eds), *The To'aga Site: Three Millennia of Polynesian Occupation in the Manu'a Islands, American Samoa*, pp. 167-187. *University of California Archaeological Research Facility, Contribution* 51. Berkeley.
- Weisler, M.I. 1994. The settlement of marginal Polynesia: new evidence from Henderson Island. *Journal of Field Archaeology* 21:83-102.
- Weisler, M.I. 1995. Henderson Island prehistory: colonization and extinction on a remote Polynesian island. *Biological Journal of the Linnean Society* 56:377-404.
- Weisler, M.I. and D.A. Clague. 1997. Characterization of archaeological volcanic glass from Oceania: the utility of three techniques. In M.S. Shackley (ed.), *Archaeological Obsidian Studies: Method and Theory. Advances in Archaeological and Museum Sciences* 3. New York, Plenum Press.
- Weisler, M.I. and P.V. Kirch. 1985. The structure of settlement space in a Polynesian chiefdom: Kawela Moloka'i, Hawaiian Islands. *New Zealand Journal of Archaeology* 7:129-158.
- Weisler, M.I. and P.V. Kirch. 1996. Interisland and interarchipelago transfer of stone tools in prehistoric Polynesia. *Proceedings of the National Academy of Sciences, U. S. A* 93:1381-1385.
- Weisler, M.I. and J. Woodhead. 1995. Basalt Pb isotope analysis and the prehistoric settlement of Polynesia. *Proceedings of the National Academy of Sciences, U. S. A.* 92:1881-1885.