



Micronesia's Breadfruit Revolution and the evolution of a Culture Area

GLENN PETERSEN

Keywords: Micronesia, social organization, subsistence, breadfruit, culture area

Abstract

Micronesia was initially settled from at least three quite separate points of origin and comprises multiple cultural and linguistic stocks. It nevertheless manifests a striking uniformity in its socio-political organization. I argue that these shared aspects of Micronesian societies diffused out of the Eastern Caroline Islands as a consequence of a prehistoric sociocultural efflorescence driven at least in part by the hybridization of two entirely different breadfruit species. The characteristic form of Micronesia's dispersed conical clans was spread throughout the entire region, carried along with the economic successes conferred by productive new breadfruit varieties. Botanical, linguistic, archaeological and ethnological data are marshaled to substantiate this argument.

Although Micronesia constitutes a coherent geographic region, it is sometimes dismissed as having little or no validity as an ethnological concept. Archaeological and linguistic evidence make it clear that the eastern and western reaches of the area were initially settled by different peoples moving out of distinctly different homelands, probably at different times. It is primarily because of these disparate origins, as compared, say, to the relative homogeneity of the Polynesians, that the existence of a valid Micronesian culture area is denied, although other sociocultural differences have also been cited (Hanlon 1989; Kirch 2000: 5; Kirch and Green 2001: 63; Rainbird 2003, 2004; Clark 2003). But it can be argued that Micronesia is, at least for comparative purposes, substantially more significant than Polynesia as a culture area. This is so precisely because of its multiple origins; the differences between Micronesia's many societies pale before their similarities. These commonalities exist precisely because of Micronesia's characteristic social form, the dispersed matrilineal clan. Micronesia is defined not by matriliney, however, but by the fact that its societies are linked together by a common, shared network of matrilineal clans and the longstanding patterns of social interaction they facilitate, and it is for this reason that it is much more informative about, or at least more representative of, the sorts of processes that have historically gone into shaping cultural regions or areas.

Baruch College, City University of New York, One Bernard Baruch Way, New York, NY 10010, USA. glenn_petersen@baruch.cuny.edu

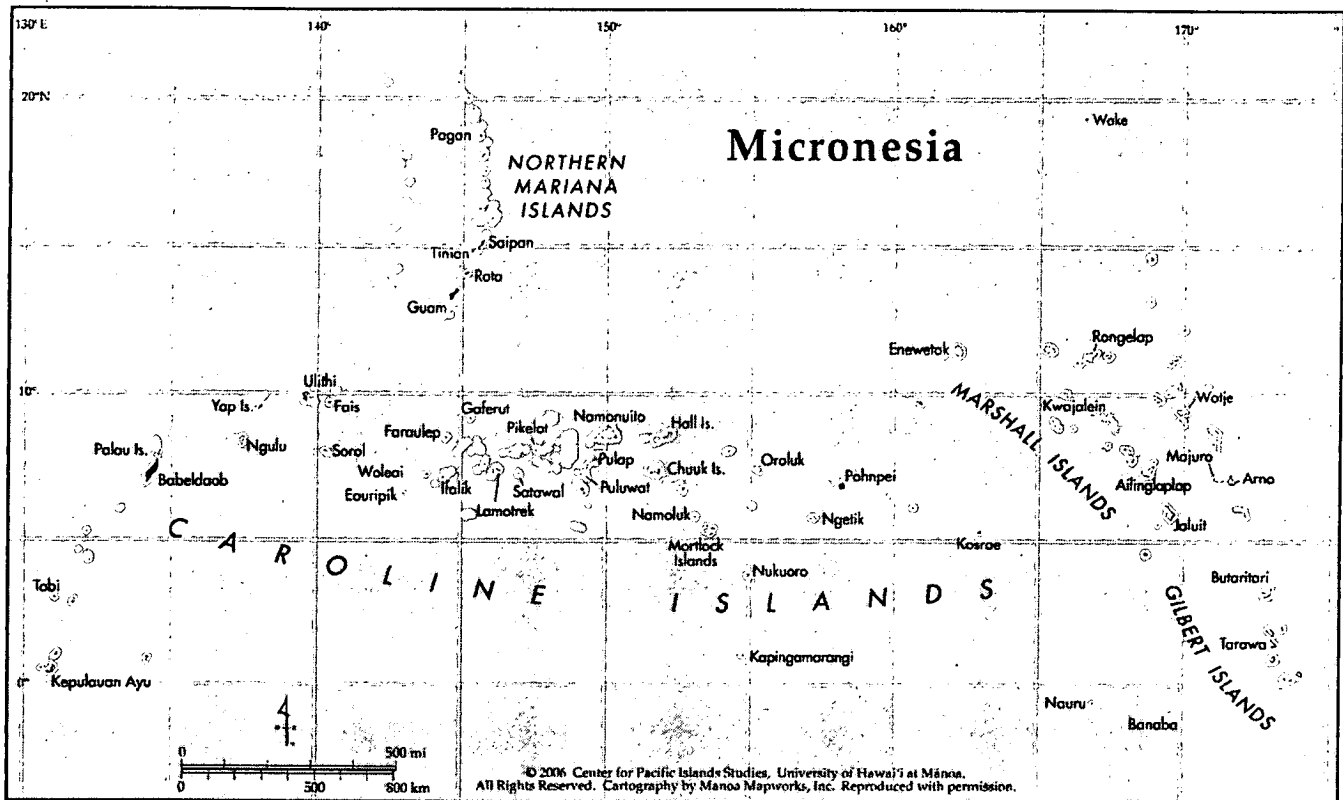
This article argues that this shared Micronesian sociocultural core is primarily the consequence of an historical process of diffusion that was driven, some 600-1200 years ago, by what might be called a 'breadfruit revolution'. This process had its genesis in the latter part of the first millennium AD in the high islands of the Eastern Carolines and then spread east and west, bearing with it a complex of cultural and social practices, including cultivation of hybrid breadfruit varieties, classic matrilineal organization, and a range of political and religious cult practices. When Dumont d'Urville first described the region he called Micronesia, he was pointing to what were in fact the results of a long process of culture history, and not merely conjuring up a convenient but ultimately erroneous rubric.

Micronesia's settlement and early prehistory

Despite the archaeological work conducted throughout Micronesia (Fig. 1) in the past few decades, the origins of the Micronesian peoples remain uncertain. As Irwin notes, "The source of eastern Micronesian settlement, somewhere between eastern Melanesia and West Polynesia, is as vague as that for western Micronesian settlement, somewhere in the Philippines or eastern Indonesia" (1992: 6-7). What follows does not review Micronesian prehistory, which has been ably covered by Rainbird (2004) but simply notes important points regarding the area's initial settlement that are critical to the main thrust of this article.

In the late first millennium BC, when eastern Micronesia was first occupied, the atolls – what are now Kiribati, the Marshalls, and some of the eastern Carolines – were probably still partially awash (Dickenson 2003; Nunn 1994). The earliest archaeologically-known settlements in the high islands, Kosrae, Pohnpei, and Chuuk, appear to represent the original occupation. It is likely that these were the consequence of multiple voyages from sites in the southeast Solomons, the Santa Cruz islands, and perhaps elsewhere in this general vicinity (Irwin 1992: 130), and that the earliest settlers were a heterogeneous lot. The peoples of all these high islands speak languages grouped into the Nuclear Micronesian branch of Eastern Oceanic.

Modern Melanesian societies in the general region out of which the Micronesians' ancestors migrated manifest a great



many different kinship and descent systems. Some are characterized by matrilineal beliefs and practices, some by patrilineal, some are bilateral, and others combine multiple aspects of these classic types. There is no compelling reason to presume that because modern Micronesia is overwhelmingly matrilineal, only matrilineality was initially introduced into the region.¹

The matrilineal forms that were carried into eastern Micronesia from Melanesia proved considerably more useful to these pioneers than the other sorts of social institutions that arrived with them. Modern Micronesia's matrilineal forms are distinctly different from those of eastern

Melanesia, but are quite similar to one another. Each comprises numerous lineages which are in turn dispersed among multiple adjacent communities and islands. Most clans have localized branches – subclans – encountered throughout entire archipelagoes (e.g. the Marshalls or the Eastern Carolines). Several are even more widely distributed, extending in some cases from Kiribati to Pohnpei and from Kosrae to the Marianas and Belau's Southwest Islands. Any given local lineage is linked to lineages on other islands not simply through ties of friendship or patterns of exchange but through deep and permanent bonds of kinship. It is the broad and supple webs of ties linking each of the constituent households or descent groups of any particular community to a substantial number of groups in other communities and on other islands that enable all the communities of an island or island group to survive. While Micronesia's matrilineality may well trace its roots to eastern Melanesia, what is diagnostic about it is quite distinct from the forms found in Melanesia and it quite misunderstands the actual situation to speak of a 'matrilineal belt' as if there were a single basic social form or type common to both areas.

The origins and prehistory of western Micronesia differ in significant ways from those of the eastern islands, with all indications being that Belau was settled from Indonesia and the Marianas from the Philippines, approximately 3000 years BP (Shutler 1999). Yap's history is highly complex, with apparent influences from the east and west and quite possibly from the Admiralty Islands (Ross 1996). Historically known societies throughout eastern Indonesia and the Philippines are overwhelmingly bilateral or cognatic in organization. The few that do practice unilineal descent are

1. Hage and Marck (2002, 2003) and Hage (1998, 1999a, 1999b) have argued that Proto-Oceanic society was matrilineal and matrilineal. They ground this thesis on assumptions about consistent, closely bound relationships among residence, descent, kin terms, and socio-political rank: "By Proto-Oceanic times residence (matrilocality), descent (matrilineality), and kinship terminology (bifurcate merging) were perfectly aligned" (Hage and Marck 2003:124). This perspective presumes correspondences between descent ideology and practical human behavior which are supported by little of the relevant ethnography from the region. While these arguments are thought-provoking and elegant, they rest upon the assumption that Proto-Oceanic speaking peoples were somehow less inclined than their modern descendants to manipulate and ignore descent ideology as circumstances and personalities dictate. Proto-Oceanic societies may have been matrilineal, but it will require far more evidence than the reconstruction of their kinship terminologies (which is by definition the only Proto-Oceanic evidence we have) to convincingly demonstrate this.

generally patrilineal (though most of these have been influenced by Islam). The only societies in this entire region reported to have matrilineal organization lie scattered among a few islands off the northeast coast of Timor (LeBar 1972, 1975).² Given the general absence of matrilineal clanship in this area, there is no compelling reason to think that the peoples who settled western Micronesia from island Southeast Asia were practicing matrilineality when they came, or that if by some remote chance they did, it survived in Micronesia any longer than it did in the Philippines or in the general vicinity of Sulawesi.

On the other hand, western Micronesia's matrilineal clans are for the most part identical to the forms that evolved in eastern Micronesia, and which proved so adaptive that they diffused westward with the Nuclear Micronesian-speaking peoples who inhabit all the Carolines atolls. That is, western Micronesian patterns of matrilineal organization are eastern Micronesian in origin. Western Micronesia was settled before the east, and yet a set of traits largely evolved in situ in eastern Micronesia came to typify western Micronesian culture and society. How did this happen? It appears to have been a consequence of a significant transformation in Micronesian economies, which in turn had tremendous effects on Micronesian social systems. This shift came as a consequence of what can be termed Micronesia's 'breadfruit revolution'.

The breadfruit revolution

Evidence suggests that much of Micronesia underwent substantial sociocultural transformations in the years between 1000-1500 AD. These entailed ecological, economic, demographic, social, and political changes in many, perhaps most of the region's societies. Aspects of this – important aspects – can best be attributed to Micronesia's breadfruit revolution, a development in the region's agricultural economies that would lead to far-reaching changes in other aspects of life there.

Eastern Micronesia's subsistence economies are tied overwhelmingly to breadfruit. Early settlers on Kosrae and Pohnpei depended upon a mix of tree and root crops with particular emphasis on breadfruit, but pollen records also show that they shifted toward a greater reliance on breadfruit (Athens 1995; Ayres *et al.* 1979). It may be that in the early settlement period only a portion of the Lapita peoples' broader crop inventory was carried northward, but it is at least as likely that in the course of the first millennium of settlement in eastern Micronesia breadfruit's unprecedented success in the Eastern Carolines resulted in the neglect or abandonment of some crops. It is worth noting

that in the Santa Cruz Islands farmers have particularly emphasized genetic modification in adapting their subsistence system by producing a wide variety of tree crops, in contrast to more typical adaptations practiced on the adjacent islands of the main Solomons chain (Yen 1982: 56-57), and that "Deliberate selection for crop staple genetic and phenotypic variability seems to be a common practice among Micronesian farmers" (Hunter-Anderson 1991: 42).

Two crops predominate in most modern Micronesian subsistence systems, taros (including the smaller *Colocasia* and the larger *Cyrtosperma* and *Alocasia* plants) and breadfruit. Taros are cultivated everywhere; in some areas, e.g. Belau and Kiribati, they are the focus of much of women's labor, provide the major share of the staple starchy foods, and have great symbolic value. They are typically Southeast Asian crops, and may have been domesticated there and/or in New Guinea; they were introduced into Micronesia both directly from island Southeast Asia and from eastern Melanesia.

Breadfruit is an important food crop nearly everywhere in Micronesia, but in many areas, especially the Eastern Caroline high islands, breadfruit is overwhelmingly the most prevalent foodstuff. It is only in the coral islands at the northern and southern margins, where rainfall is not ordinarily plentiful, that breadfruit does not play an essential role in islanders' diets and is largely supplanted by pandanus. Coconuts are widely cultivated and are important in islanders' diets, but for the most part they enhance other foods rather than provide staple food value themselves.³ Bananas also make contributions to local diets but are only occasionally considered truly central elements in local cuisines.

Breadfruit is noteworthy for a number of reasons. In addition to being an excellent source of nutrition it can be prepared in a wide variety of ways, some as simple as roasting directly on hot coals and others entailing elaborate cooking, pounding, and embellishment with coconut cream (Pollock 1992). Ragone (1997) provides a comprehensive account of the distribution, genetics, and uses of breadfruit in the Pacific islands. Cultivation requires very little labor input once new shoots are transplanted. On some of the high islands one variety or another produces fruit virtually year round. In peak season breadfruit trees bear in astonishing abundance, providing surpluses that can be fermented in pits (a process known as ensilage) and preserved for later use. When combined with the fish stocks that abound in the reefs and lagoons of most islands, breadfruit provides a healthy, stable, and substantial diet in return for remarkably little effort. Pohnpeians have been known to joke that the only way to truly transform their people's relaxed approach to life would be to take chainsaws to the island's breadfruit trees.

2. When I initially presented this material at the Island Archaeology conference (Auckland 2005), several knowledgeable colleagues asserted that the Toraja of Sulawesi practice matrilineal descent. For the record: "Descent in Toraja is traced bilaterally" (Hollan and Wellenkamp 1996:11); "Toraja reckon kinship bilaterally, giving equal weight to male and female ancestors and ideally creating as large a family as possible" (Volkman 1985:48-49).

3. The dense stands of coconut trees that typified Micronesian environments in the late nineteenth and twentieth centuries are artefacts of plantings made for commercial copra production, often stimulated or enforced by colonial governments. They are not representative of the aboriginal landscape.

This easy way of life is fundamental to so much of modern Micronesian living that it is difficult to imagine it otherwise, and yet it must have been quite different fifteen hundred to a thousand or so years ago, before the breadfruit revolution. Two key sets of evidence, neither of them particularly well-developed as yet, lead to this conclusion. The first comes from archaeology; the second from the work of botanists.

Archaeologists have described what they call the 'long gap' in the array of cultural materials among the islands of Chuuk Lagoon. Early sites contain pottery sherds similar to those found on Pohnpei and Kosrae, and date to approximately the same time period, late in the first millennium BC, circa 2000 years ago. But there is only sparse evidence of occupation from succeeding centuries, until about 1200-1300 AD, when the population seems to have begun increasing rapidly, in conjunction with materials (which do not appear in the earlier contexts) indicating heavy reliance upon breadfruit. King and Parker (1984) observe that this breadfruit-associated efflorescence appears almost out of nowhere and that it was accompanied by substantial stone architectural construction which local people in some cases explain through mythohistorical accounts celebrating connections to the people, deities, and politics of Pohnpei and Kosrae. That is, a major change in Chuukese social life appears to have been associated with both the development of a marked reliance on breadfruit and sociopolitical influences from the east. Similar patterns have been noted other parts of Micronesia, as aspects of "the great settlement expansion and cultural elaborations of the AD 1000s-1500s" (Hunter-Anderson 1991:18).

Breadfruit genetics indicate that two distinct types of breadfruit – one growing wild on Micronesian islands with continental origins, like Belau and the Marianas, and the other found from New Guinea eastward into Polynesia – were brought into contact with one another somewhere in the Eastern Carolines and subsequently produced numerous hybrid forms, some of which were eminently suitable to cultivation on atolls. It would appear that the typical eastern Melanesian-Polynesian seedless breadfruit, known generally as *Artocarpus altilis*, and thought to be a domesticate derived from the wild species *A. camansi*, was carried northward by early settlers into eastern Micronesia. At some point, probably in the first millennium AD, it hybridized with the wild, seeded Marianas *dugdug*, *A. mariannensis*, then spawned the varieties that now thrive throughout Micronesia (Zerega 2003; Zerega *et al.* 2004; Ragone 2001a).⁴ Although able to establish the sources of the

hybridized Micronesian breadfruit, botanists have not yet been able to provide us with more specific insights concerning precisely where or when this process took place.

This breadfruit hybridization had numerous and far-reaching ramifications. Among them are the following attributes:

1. Hybrid varieties, which are salt tolerant, provided the Micronesian atoll populations with a major new food source, one that had not been previously available to them in any significant quantities.
2. The number of varieties (cultivars) of breadfruit historically cultivated on Kosrae, Pohnpei, and Chuuk is nothing short of extraordinary, and as a consequence fresh breadfruit is available on these islands virtually throughout the year. Pohnpeians, for instance, speak of four minor breadfruit seasons in addition to the five-month major season (Lawrence *et al.* 1964:47).
3. Because breadfruit requires so little labor input beyond harvesting (which is literally done with nothing more than long pole with a fork at its tip), it effectively frees up a good deal of surplus manpower.
4. Breadfruit supplies vast quantities of quality carbohydrates in environments where protein is readily available from the sea. In the course of a year, an average acre on Pohnpei can yield more than three tons of breadfruit and in some areas over five tons (Raynor 1989; Petersen 1975, 1977).
5. The quantities of the fruit available for preservation by pit fermentation (called *mahr* on Pohnpei and known by cognate terms elsewhere) are great enough to feed people in times of drought and following storm damage; pit breadfruit also serves as a prestige food on many islands. Pohnpeians report that they have been able to store individual lots of breadfruit in pits for up to fifty years (Lawrence *et al.* 1964:55).
6. On Pohnpei at least, breadfruit trees are extraordinarily resilient. Hambruch, who worked on the island in 1910, was told that within *two months* of the 1905 typhoon, which by all accounts was the single most powerful storm to strike the island in recorded history, breadfruit trees, which had been entirely denuded, were fully leaved and bearing young fruits "as large as walnuts" (1932: 348) and I have observed trees fruiting within weeks after the end of a rare six-month El Niño-Southern Oscillation (ENSO) induced drought.
7. Breadfruit trees are long-lived and continue yielding steadily over the years; on the eastern high islands some trees have been known to bear fruit over periods longer than normal human life spans.

It is safe to say that the impact of a quantum increase in the availability of fresh and preserved breadfruit revolutionized Micronesian subsistence, and thus created conditions for major changes in society as a whole.

A. altilis breadfruit is quite sensitive to salt and does not grow well, if at all, on atolls. Ragone (2001a, 2001b) reports that breadfruit does not grow on Polynesian atolls other than in Tuvalu and Tokelau, where the Micronesian hybridized

4. This hybridization process is technically termed 'introgression', i.e. transmission of genes from one species into the gene pool of another through repeated backcrossing of a hybrid. Although seedless breadfruit is propagated vegetatively with cuttings, it continues to flower and can thus be naturally as well as artificially fertilized and cross-bred. Older studies (e.g. Fosberg 1960; Barrau 1961; Coenen and Barrau 1961) pointed out the morphological evidence of this hybridization, but it is only the recent work of Ragone and Zerega that has established the genetics of this process.

forms have been established. Breadfruit, however, thrives on Micronesian atolls (Stone 1951; Ragone 1988), and it is the salt tolerance of the *A. mariannensis*-*A. altilis* crosses that permit this (Ragone 1997: 17-18). Where annual rainfall drops below about 1900 mm per year, in the northern Marshalls and southern Kiribati, breadfruit does not thrive and pandanus takes on a much more substantial role, but on wetter atolls such as Arno and Namu it is the primary element in diets for half the year, both when it is in season and for months afterwards when stocks of preserved pit breadfruit are consumed (Stone 1951; Pollock 1974: 109-113). High rainfall is especially critical to breadfruit cultivation on atolls because it maintains the fresh water lens upon which the roots draw. While temporary drought conditions on high islands may keep trees from bearing fruit, on coral islands significant drought conditions will kill trees outright. Higher population densities and the relatively marked degree of social stratification in the Marshalls are quite likely related to the ample food supplies made possible by breadfruit. The greater degree of social stratification in the northern Kiribati (in comparison with the southern islands) has long been attributed to the higher rainfall, increased fertility, and consequent abundance of breadfruit there (Wilkes 1845: 73-75; Geddes *et al.* 1982: 38).

High islands like Pohnpei and Kosrae have remarkably large numbers of named breadfruit varieties. Hambruch listed 43 breadfruit varieties on Pohnpei in 1910 (1932: 353); Bascom, working immediately after the Second World War, recorded the names of 78 varieties (1949: 98); Lawrence *et al.* reported 80 (1964: 44), while a little more than a generation later Ayres and Haun reported 150 varieties on the island (1990: 214). Pohnpeian farmers' abilities to increase their crop inventories have clearly been enhanced by improved means of inter-island transportation. Vast, if not quite so remarkable numbers of breadfruit varieties are also characteristic of Kosrae and Chuuk (Hunter-Anderson 1991; Ayres and Haun 1990). But even among the atolls, where *A. altilis* breadfruit is not ordinarily viable, the hybrids thrive; 24 varieties have been recorded in the Marshalls alone (Mackenzie 1960). It is this incredible variation that makes breadfruit so extraordinarily abundant. Differing varieties are adapted to a range of micro-climates and bear at diverse times throughout the year; but all Micronesian cultures make a basic division of the year into two seasons – when breadfruit bears and when it does not.

Botanical, linguistic, and archaeological data indicate that *A. altilis* breadfruit was introduced into eastern Micronesia from the south. The Santa Cruz Islands, which seem a likely source for much of early Nuclear Micronesia's origins, are characterized by dense agroforest that is in many ways similar to that of Pohnpei and Kosrae, although arboriculture there relies on a wider range of tree crops (Yen 1974; Athens *et al.* 1996); "The greatest diversity of seeded and few-seeded cultivars is found in the eastern Solomon Islands and Vanuatu, and it was probably in the Santa Cruz and possibly the Banks Islands that breadfruit was first extensively cultivated and selected" (Ragone 1997: 19). These first trees were of course limited to the *A. camansi-*

derived *altilis* varieties. The introduction of western Micronesian *A. mariannensis* into eastern Micronesia would have come as consequence either of voyagers from the west traveling into the east or vice versa, or perhaps some combination of both. It may have happened in a single specific locale or in a number of different places. It might have been a unique event but is more likely to have been a gradual process. It most certainly occurred because the farmers were already deeply committed to working with breadfruit variation and would have both eagerly sought out new varieties and immediately recognized the value of the new hybrids when they appeared.

The developmental surge archaeologists identify in late prehistoric eastern Micronesia, and which appears to be linked to this breadfruit revolution, is most apparent at Nan Madol, on Pohnpei. On the island's eastern, upwind shore, in the shallows where the barrier reef encircling the island reaches landward and becomes a fringing reef abutting the shoreline, a network of constructed channels connect an extensive complex of artificial islets, some capped by imposing structures built of immense basalt blocks. Remains of the earliest human activities at this location have been dated back two thousand years and it is quite possible that this site is one of the spots the first travelers to Pohnpei originally settled. Initial work on the creation of Nan Madol as a ritual and/or political center of some sort dates to perhaps 900-1100 AD, and full-scale construction on the complex has been dated to 1200-1600 (Bath and Athens 1990; Kirch 2000: 197-198). An analogous, though much smaller complex is located at Lelu on Kosrae; initial construction there is dated to 1250-1400, with the most extensive work undertaken 1400-1650 (Cordy 1993; Athens 1995; Kirch 2000: 202-204).

Little in the general sweep of Kosrae or Pohnpeian social, cultural, and political beliefs and practices is exceptional or even particularly different from either the rest of Micronesia or Remote Oceania. But aspects of these practices were directed toward large-scale mobilization of labor, and something out of the ordinary took place to bring about the social conditions that led to construction of Nan Madol and Lelu. Breadfruit hybridization and a subsequent rise in the productivity of subsistence systems do not alone explain this burst of creative energy – Chuuk's subsistence economy is, if this is possible, even more focused on breadfruit than that of the other high islands, but its political economy is much less elaborated than theirs. Yet the emergence of the Eastern Carolines' breadfruit economy must be reckoned with. Although Kosrae's and Pohnpei's political systems are quite centralized by many standards, breadfruit production requires little labor and trees produce for scores of years and little if any centralized labor management or decision-making is entailed. Pohnpeian chiefs traditionally travelled about a great deal, visiting local communities and feasting *en situ*, while on Kosrae food was transported by water to chiefs living at Lelu. The Eastern Carolines do not fit standard models for the evolution of chieftainship that rely upon frameworks of economic centralization or coercion (cf. Peoples 1993). The

timing of breadfruit's introduction into Chuuk, combined with an appreciation for the impact of hybridization and its consequences, rather, shed light on why the peoples of Kosrae and Pohnpei were able to accomplish their magnificent construction feats – they must have experienced an extraordinary, steadily-increasing rise in available human resources over the course of centuries.

It is possible that Pohnpeians (and perhaps Kosraens) consciously sought to disseminate the fruits of their innovations. An outcropping with extensive rock art incised into it lies in Sapwalap, not far inland from Nan Madol. One of the predominant motifs in this assemblage, an 'enveloped cross', resembles patterns found further south in the region of the late Lapita homeland. Noting this site's juxtaposition with the monumental construction at Nan Madol itself, Paul Rainbird argues that "Pohnpei was part of a sea of islands with communities in regular contact over the past thousand years or more," and suggests

that one of the conscious consequences of building the structures at Nan Madol was to attract visitors from other islands. This would have brought Pohnpeians notoriety across the western Pacific sea world and the satisfaction that they would be the recipients of such things as knowledge, gifts, trade, and people without having to venture far beyond their own barrier reef (2002: 142).

The nature of influences or relations between the complexes at Nan Madol and Lelu are not understood, but both their timing and their fundamental similarities suggest that they came as consequences of the breadfruit revolution that took place on Pohnpei and Kosrae.

It is possible that Chuuk was involved in the processes of breadfruit hybridization as something more than a way point, but not likely. The juxtaposition of a sudden shift in archaeological deposits, associated with breadfruit processing materials (primarily shell peelers), and Chuukese mythohistorical accounts stressing the influence of Kosrae and Pohnpei indicates that the breadfruit revolution first occurred farther east and only then was carried westward into Chuuk, probably from the Mortlocks atolls. Parker and King suggest that it was not until the fourteenth century AD that the new cultural pattern penetrated into Chuuk Lagoon societies, entailing an intensification in breadfruit use, significant population changes, and the spread of the Sou Katau "cult"; they believe these innovations were in some way related to developments taking place during the same period on Kosrae and Pohnpei (1981: 25).⁵ Pakin and And atolls lie just off Pohnpei's western shore and there are coral islets (motus) at several spots on Pohnpei's barrier reef; the salt-resistant character of the new hybrids may have been first exploited there, before they diffused to more distant atolls and beyond, through the Mortlocks to Chuuk Lagoon. Hybridized breadfruit varieties were carried eastward and southward into the Marshalls and Kiribati as well, where they served as catalysts for tremendous increases in atoll productivity and population numbers on the wetter islands.

5. In Pohnpeian orthography, this is spelled Katau but it is pronounced Kachau.

A mythohistorical account from Mili tells of a time when there was no breadfruit in the Marshalls and of how it was introduced and spread (Mackenzie 1960: 13).

From Chuuk these hybrid varieties traveled relatively quickly first through the central and western Caroline atolls and then on into the Marianas, Yap, and Belau. They are well-established on Belau's Southwestern Islands, which are atolls inhabited by peoples speaking Central Carolines' dialects. The atolls and the Marianas depended heavily upon breadfruit in historic times, Yap and Belau less so. In the Marianas' Chamorro language breadfruit is 'lemai', a cognate of Nuclear Micronesian *mai/mei*, while Belauan and Yapese terms are not. Although breadfruit is an important crop in these latter two groups, it is by no means the pre-eminent food stuff. Belauans do report that their seedless varieties are more tolerant of salinity, which is of course the reason the *A. altilis* hybrids were able to diffuse there from the east (McKnight 1960: 2-6).

There is a general continuum in Micronesian food crop distribution, with yams and taros providing the predominant staples in the west and breadfruit prevailing in the east. There are many reasons for this, at least some of them environmental. The western high islands all lie inside the andesite line, and their soils are distinctly less robust than those of the younger volcanic islands to the east. Moreover, the western islands are subject to a somewhat different climatic regime than those in the east. Belau, Yap, and the Marianas are affected by Southeast Asia's monsoon regime, and rainfall in the west is not only less abundant but also more seasonally distributed (Hunter-Anderson 1991: 47). Although the wild, seeded dugdug breadfruit is native to these islands, with their continental geology, their staple cultivated breadfruit varieties are the same *A. altilis*-*A. mariannensis* hybrids that characterize eastern Micronesia. They were clearly introduced from eastern Micronesia, and brought in their wake significant sociocultural influences as well.

While the development and spread of the new breadfruit varieties had a major impact on subsistence in Micronesia, it is the resulting influence on social organization throughout the region that is many ways most remarkable. The archaeological record has not yet yielded much insight into the interactions that took place between the eastern and western spheres during the early period, but they do seem to have been extensive. The emergence of what was in many ways a new economic order, however, intensified whatever had been taking place. The evidence of such diffusion is of various sorts but it comes from throughout central and western Micronesia.

The social and cultural consequences of the breadfruit revolution

Hybrid breadfruit's suitability to atoll environments, in combination with lagoon fisheries, made it possible for these societies to sustain population sizes that were previously inconceivable. These newer, larger populations

were successful enough to produce significant surpluses of a limited range of goods for exchange. They remained, however, vulnerable to the same climatic exigencies, and their exchange relations with other islands were maintained with an eye toward surviving these recurring crises. The systematic connections linking the islands west of Chuuk to one another and to Yap, in particular, were enhanced by (if they were not originally formed by) these factors. With the development of the hybrid varieties, these newer and stronger links were added to the already existing ties to Yap and Belau (Intoh 1996; Alkire and Fujimura 1990). A complex pattern of behaviors and values diffused from Nuclear Micronesia. In time the peoples of the eastern and western islands would come to share characteristically pan-Micronesian social and cultural lifeways. It seems that the success of the breadfruit revolution, with all its accompanying social and cultural ramifications, and providing impetus for expanding populations, proved so impressive to the peoples of the west that they incorporated matrilineal organization into their societies quite quickly, though the sequencing and rate of this diffusion remains far from clear.

Linguists have called attention to what appear to be sporadic rather than continuous connections between Chuuk and Pohnpei (Bender and Wang 1985: 70; Rehg 1995: 317-319). While ties between them may have come and gone over the centuries, clear evidence of Pohnpei's cultural influence on Chuuk is from relatively recent times, and quite probably derives directly from the cultural efflorescence spawned by the breadfruit revolution.

People in the islands of Chuuk Lagoon speak in terms of two sorts of clans, those with earlier origins and the later, 'immigrant' clans which claim chiefly status. These latter clans are associated with what Goodenough calls a 'cult of Achaw' or Kachaw/Kachau (Katau in Pohnpeian orthography), "and there is evidence to suggest that it was introduced there from Ponape, which may have served as a center of influence from which versions of this cult were carried to other parts of eastern Micronesia," including the Marshalls and possibly Kiribati. Variant traditions and mytho-historical accounts from throughout this region reflect a local notion that there once existed a "Kachau Empire" (Nakayama and Ramp 1974). Variants of the term Katau/Achaw occur throughout eastern and central Micronesia, referring to a legendary place in the east from whence early Micronesians immigrated and powerful mythohistorical figures originated; it may also refer in some contexts to Kosrae (Goodenough 1986; Mauricio 1987). The high islands' successes may be reflected not simply in their influences in Chuuk Lagoon, but also in the transport of basalt slabs to a number of eastern Micronesian atolls for use as shrines, perhaps in recognition of their role in generating cultural efflorescence throughout the area (Goodenough 1986).

The atolls between Chuuk Lagoon and Yap provide additional evidence. They lie in the very heart of the typhoon belt and their limited dimensions make them especially subject not merely to immediate, short-term storm damage but to long-term destruction of their gardens.

These islands are productive and densely populated, but their peoples depend utterly and absolutely upon preserving close ties with adjacent islands via the webs of matrilineal kinship, and linguistic patterns reflect the magnitude of these connections (Marck 1986). The relative rank of lineages and clans is, consequently, a matter of great concern in maintaining the integrity of these linkages. On Ifaluk, for example, "Rank is so highly valued and respected that it stands out as one of the master-values of this culture" (Burrows and Spiro 1970: 179). And relative rank is for the most part officially established through settlement priority – the first clan to establish itself in a given island or community is generally recognized as having the right to provide the leading chiefs. But this seemingly straightforward formula is in fact thoroughly complicated by the islanders' awareness of two contrary ways of calculating rank.

The inhabitants of this chain of atolls trace the origins of their communities and their clan histories both to Yap in the west and through Chuuk to legendary Kachau in the east (Komatsu 1990, Sudo 1996). Potsherds excavated on Fais and Lamotrek provide evidence of regular contact with Yap, and perhaps even Belau, after these islands were settled but it is not clear just when this was, nor is it clear whether there were dealings with the Nuclear Micronesian-speaking peoples to the east at this early stage (Intoh 1996; Alkire and Fujimura 1990).

The *sawei* (sometimes called tribute) voyaging system linked together all the smaller islands and led westward to Yap, which provided them with critical high island resources and potential refuge during the worst of times (Lingenfelter 1975; Alkire 1989; D'Arcy 2001; Petersen 2000). Mytho-historical accounts suggest that the islands were first settled from Yap. At the same time, however, a complementary set of mythohistorical accounts trace the origins of many of the contemporary clans to the spiritually more prestigious Katau. Islands farther west are likely to emphasize their ties to Yap, while people in the eastern islands stress their Katau connections.

Because the order of settlement of individual islands in relation to adjacent islands accounts for important aspects of rank between their respective communities, the ancestral migrations out of Katau and into the atolls are central to the entire system of rank. Micronesian politics are in part organized around competing grounds for legitimizing chiefly status, but the critical point here is the islanders' frank recognition that despite the fundamental stress they place on settlement priority, precedence based on settlement from and ties to Yap is on occasion trumped by the status that inheres in later ties to Katau. The impact attributed to Katau is almost certainly a consequence of the diffusing Nuclear Micronesian influences that were set in motion by the breadfruit revolution. Indeed, the most widely distributed descent group in Micronesia is the 'Under-the-breadfruit-tree-clan' (Pohnpeian Dipwenpahnmei), members of which are dispersed from Kosrae in the east (commonly associated with, if not identified as, Kachau) to the Marianas and to Pulo Ana in the far southwest (Marck 2004).

A parallel appears in Belau's mythohistory. According to Belauan accounts the archipelago's matrilineal clans are relatively late arrivals, having immigrated from Ngeruangel, a small, uninhabited atoll just north of Kayangel atoll (which is larger, inhabited, and an integral part of the Belauan islands); these northern islands provide the best archaeological evidence of interactions with Yap (Intoh 1981: 69). At the very heart of Belauan matrilineal organization are stories that explain the dispersed nature of each clan's lineages in terms of migration histories, as these newly arrived groups traveled about establishing themselves throughout Belau (Smith 1983: 41-63; Aoyagi 1982: 20). I generally hesitate to put mythohistorical accounts, which are inevitably complex and subject to too many unknown factors, to use for comparative purposes, but because of its seeming consistency in this context I note that Belauan legendary history portrays the matrilineal clans as having come relatively recently to Belau. Belauans cultivate both seedless and seeded breadfruit varieties. "The five seedless varieties are thought of [by Belauans] as recent acquisitions" (McKnight 1960: 4). Harvesting and processing techniques, particularly fermenting, are essentially identical those in the Central and Eastern Carolines. While breadfruit in Belau has neither great economic importance nor socio-political prestige associated with it, it plays a central role in a widely recounted and crucially fundamental myth concerning Milad, a dominant cultural heroine associated with, among other things, the rebirth of Belauan society after a particularly destructive era (McKnight 1960; Nero 1992). That is, breadfruit, which Belauans believe to be a relatively recent introduction, derives its importance in Belauan culture from relatively recent social dynamics as well, an indication that its entry into Belau is in some ways associated with the arrival of the matrilineal clans. It is worth noting that in contrast to, e.g. Belau and the Marshalls, Pohnpeians say they have no specific myth or oral tradition relating to the origins of breadfruit on their island (Lawrence *et al.* 1964:57).

In fact, even in the Nuclear Micronesian homelands, in Pohnpei, Kosrae, and the Marshalls, most matrilineal clans have extensive migration myths that explain the ways in which their subclans and lineages came to be dispersed among many islands and archipelagoes. It is in the nature of Micronesian matrilineality that clans are understood to link together lineages settled in multiple communities on multiple islands; the central Carolinian atoll and Belauan versions I have just cited elaborate on the clans' movements into territory that was already occupied by other populations.

There is no indication of any close connection between the populations that originally settled Belau and the Marianas; Yap, too, appears to have its own distinctly separate origins. Yap's matrilineal clans are, nevertheless, called *genung*, derived from the Oceanic descent group term *kainanga* and all its Nuclear Micronesian cognates. And although the Belauan and Chamorro languages have entirely different words for clans and lineages, their structure and organization are essentially the same as those of eastern

Micronesia's descent groups. There is simply no good case to be made for western Micronesia's matrilineal clans having been introduced from anywhere but eastern Micronesia.

Conclusion

We see in Micronesia, then, a case in which discrete streams of sociocultural development to some extent reconverged. After a separation of several millennia, historically related but quite distinct societies with immediate roots in what are now the Philippines, Indonesia, and eastern Melanesia, each of which had entered what we now call Micronesia independently, forged connections with one another, even as they were developing relatively autonomously – these are voyaging peoples, after all. As a consequence of the earliest of these interactions, which carried western seeded breadfruit into the realm of the eastern seedless varieties, major economic, social, and political developments were wrought in the Eastern Carolines. These innovations were so successful that they soon diffused outward.

The intersection of the hybrid breadfruit's overwhelmingly greater productivity with the matrilineal clans' adaptive qualities in the area where this breadfruit revolution initially began meant that matrilineal organization diffused as part and parcel of the new productive regime. In some cases, as in northern Kiribati, breadfruit remains ascendant even while aspects of matrilineality have been masked by the more recent Samoan intrusions. (Although Kiribati kin groups [*bwoti*] are no longer matrilineal in manifest form, they retain the dispersed linkages that are characteristic of Micronesian matrilineality. In this they differ distinctly from adjacent Polynesian societies and are clearly Micronesian in nature.) In some cases, matrilineal organization remains ascendant while breadfruit itself occupies only a marginal role in subsistence, as in Belau. And in other cases, as in the Marianas and western atolls, both breadfruit and matrilineal organization remain crucial elements of the sociocultural repertoire. In all but the Kiribati case, however, the dispersed matrilineal clans, which create web after web of institutionalized linkages among the many islands and communities, and which are essentially impervious to the vagaries of time, individual idiosyncrasy, and environmental exigency, have remained vital and dynamic. It is the quality and longevity of these ties, along with the functions they actually fulfill, that are characteristic of Micronesian societies, and not simply matrilineal descent per se.

We see here one of the most salient consequences of the early Micronesian lifeway's continued reliance upon relatively frequent and productive interactions among the widely spaced communities of islands. While in Polynesia there was always a degree of interaction among communities *within* localized subregions, there was little or no contact between many of the distinct island groups (Barnes and Hunt 2005: 248; Kirch and Green 2001: 71-90). In Micronesia, on the other hand, the atoll peoples' wide-ranging journeys, coupled with the integrating dynamics of

the dispersed clan system meant that there was a high degree of ongoing interaction taking place across the region's vast distances.

Micronesia has been given short shrift in recent overviews of Pacific prehistory. "Such labels [as Polynesia, Melanesia, Micronesia] provide handy geographical referents, yet they mislead us greatly if we take them to be meaningful segments of cultural history. Only Polynesia has stood the tests of time and increased knowledge, as a category with historical significance" (Kirch 2000: 5). "Whatever analytical units may develop through future research, these surely will *not* be the overworked and outdated categories of 'Melanesia' and 'Micronesia.' From our knowledge of the histories and diversity of these two regions – whether linguistic, biological, or cultural terms – there can be no doubt that these units are fatally flawed" (Kirch and Green 2001: 63). Rainbird, although quite critical of the concept in some contexts (e.g. 2003), brings a marked appreciation to the nuances of the question in *The Archaeology of Micronesia*. He says he uses the term Micronesia 'as shorthand for the region' and refers to 'this non-region commonly termed Micronesia', but also acknowledges "I think we can accept that there are some elements that exist within the bounds of what is commonly regarded as Micronesia, that may be distinct from elsewhere. However, it still has to be acknowledged that none of these cultural traits could actually be used to provide a boundary that would match the one established in the nineteenth century and still in general use today" (2004: 40, 253, 47).

Micronesia presents us with a case in which *e pluribus unum* (out of many came one). In comparative terms, as Kirch and Green might put it, Micronesia is not 'monophyletic', but rather 'multiphyletic'.⁶ Acknowledging this fact requires a good deal of reconsideration before we conclude, as some have, that Polynesia, with its monophyletic origins, should serve as a pre-eminent model for comparative studies of culture regions. That is, Micronesia *does* constitute a valid, coherent culture region. It is not, as has sometimes been said, merely a colonial construct. Its character is indeed heterogeneous, but the similarities are vastly more telling than the differences, and the processes that forged them are well worth studying.

It might be argued, of course, that this perspective is tainted by one of classical diffusionism's fatal flaws, that it focuses primarily or entirely on similarities while ignoring differences. I have not sought to diminish differences here, however, but rather to demonstrate that the similarities are

in fact commonalities, and that Micronesian matrilineal clanship is largely, if not entirely, a single shared system extending across the region. Whatever local differences there are, and there are many, they pale in comparison to the integrating force of Micronesian social organization.

Despite their different historical origins, and the different languages spoken in them, the societies occupying all the islands from the atolls southwest of Belau, through Belau, the Marianas, across the central atolls, through the Eastern Carolines high islands, and into the Marshalls and Kiribati – that is, the geographic expanse we call Micronesia – were not merely in contact with one another, but were connected to one another through a common, shared system of matrilineal clanship by the time Europeans first arrived in their waters. The central tenet of this common system was the maintenance of links among the localized lineages of dispersed clans. While based on elements common to much of Austronesian and Oceanic social organization, its evolution as a composite whole was a specific adaptation to conditions in eastern Micronesia, a fundamental element in an original Nuclear Micronesian lifeway. Any suggestion that Micronesia is merely part of a 'matrilineal belt' extending out of eastern Melanesia overlooks the radically different character of Micronesian matrilineality and the ways in which it functions to integrate the entire area.

This system of formal relationships diffused throughout the Nuclear Micronesian homeland in Chuuk, Pohnpei, Kosrae, the Marshalls, and Kiribati. In later centuries it spread, with the diffusion of hybridized breadfruit, westward and eventually came to characterize all the island societies of western Micronesia as well. We know from other parts of the Pacific that peoples with unrelated languages may be virtually undistinguishable culturally (Ross 1996:183), and while a number of Micronesia's languages are distinctive, as a consequence of their different origins and environments, the similarities among their cultures far outweigh their differences.

This is a simplification of complex processes and a long sweep of history. While it is grounded upon the available data, it remains speculative, and I am of course aware of criticisms that might be leveled against it; questions of both relative and absolute dates are of course the most challenging. But my point is that social and cultural life in Micronesia is, despite a host of local differences, marked by a significantly greater degree of integration than many have granted it. A breadfruit revolution and the expansion of matrilineal clanship would appear to account for this, and further archaeological, linguistic, and ethnological work will, I hope shed more light on these developments.

Acknowledgements

Earlier versions of this article were presented at the December 2004 Global Perspectives on the Archaeology of Islands conference in Auckland and at the February 2005 annual meeting of the Association for Social Anthropology in Oceania on Kauai; I am grateful for the ensuing discussions of this material. I want particularly to

6. In comments he made at the island archaeology conference where I first presented this material, Roger Green spoke of 'synologies' – i.e. similarities produced by diffusion or borrowing – as describing the correspondence between eastern and western Micronesian societies. Elsewhere, he has referred to 'the trellis, lattice or reticulated graph' and the interplay of 'traditions', 'horizons' and 'vertical transmission' (2003: 114-115), all of which characterize aspects of the processes I am describing here.

acknowledge the thoughtful commentaries and encouragement I have received from Roger Green, Jeff Marck, Karen Nero, Nancy Pollock, and Michael Rynkiewicz. I thank the University of Hawai'i's Center for Pacific Island Studies and Manoa Mapworks for Figure 1.

References

- Alkire, W. 1989. *Lamotrek Atoll and Inter-island Socio-economic Ties*. Prospect Heights: Waveland.
- Alkire, W. and K. Fujimora 1990. Principles of Organization in the Outer Islands of Yap State and Their Implications for Archaeology. In R. Hunter-Anderson, (ed.), *Recent Advances in Micronesian Archaeology*. Micronesica Supplement 2: 75-88.
- Aoyagi, M. 1982. The Geographical Recognition of Palauan People. In M. Aoyagi, (ed.), *Islanders and their Outside World*. Tokyo: Committee for Micronesian Research, pp. 3-34.
- Athens, J.S. 1995. *Landscape Archaeology: Prehistoric Settlement, Subsistence, and Environment of Kosrae, Eastern Caroline Islands, Micronesia*. Honolulu: International Archaeological Research Institute.
- Athens, J. S., J. Ward and G. Murakami 1996. Development of an Agroforest on a Micronesian High Island. *Antiquity* 70: 834-46.
- Ayres, W., A. Haun, and C. Severance 1979. *Settlement and Subsistence on Ponape, Micronesia*. Interim Report 78-2, Ponape Archaeology Survey. Eugene: Department of Anthropology, University of Oregon.
- Ayres, W. and A. Haun 1990. Prehistoric Food Production in Micronesia. In D. Yen and J. Mummery, (eds), *Pacific Production Systems*. Canberra: Department of Prehistory, Research School of Pacific Studies, Australian National University, pp. 211-277.
- Barnes, S. and T. Hunt. 2005. Samoa's Pre-contact Connections in West Polynesia and Beyond. *Journal of the Polynesian Society* 114: 227-66.
- Barrau, J. 1961. Subsistence Agriculture in Polynesia and Micronesia. *B.P. Bishop Museum Bulletin* 223. Honolulu: Bishop Museum.
- Bascom, W. 1949. Subsistence Farming on Ponape. *New Zealand Geographer* 5: 115-29.
- Bath, J. and J.S. Athens 1990. Prehistoric Social Complexity on Pohnpei. In R. Hunter-Anderson, ed., *Recent Advances in Micronesian Archaeology*. Micronesica Supplement 2: 275-90.
- Bender, B. and J. Wang 1985. The Status of Proto-Micronesian. In A. Pawley and L. Carrington, (eds), *Austronesian Linguistics at the 15th Pacific Science Congress*. Pacific Linguistics C-88. Canberra: Australian National University, pp. 53-92.
- Burrows, E. and M. Spiro 1970. *An Atoll Culture: Ethnography of Ifaluk in the Central Carolines*. Westport, CT: Greenwood.
- Clark, G. 2003. Dumont d'Urville's Oceania. *Journal of Pacific History* 38: 155-61.
- Cordy, R. 1993. *The Lelu Stone Ruins (Kosrae, Micronesia)*. Asian and Pacific Archaeology Series, No. 10. Honolulu: Social Science Research Institute, University of Hawaii.
- Coenen, J. and J. Barrau 1961. The Breadfruit Tree in Micronesia. *South Pacific Bulletin* 11 (4): 37-39.
- D'Arcy, P. 2001. Connected By the Sea. *Journal of Pacific History* 36: 163-82.
- Dickinson, W. 2003. Impact of Mid-Holocene Hydro-Isostatic Highstand in Regional Sea Level Habitability of Islands in the Pacific Ocean. *Journal of Coastal Research* 19 (3): 489-502.
- Fosberg, F.R. 1960. Introggression in *Artocarpus* in Micronesia. *Brittonia* 12: 101-13.
- Geddes, W.H., A. Chambers, B. Sewell, R. Lawrence and R. Watters 1982. *Atoll Economy: Social Change in Kiribati and Tuvalu*. Islands on the Line: No. 1, Team Report. Canberra: Australian National University.
- Goodenough, W. 1986. Sky World and This World: The Place of Kachaw in Micronesian Cosmology. *American Anthropologist* 88: 551-68.
- Green, R. 2003. The Lapita Horizon and Traditions – Signature for One Set of Oceanic Migrations. In C. Sand, (ed.), *Pacific Archaeology: assessments and prospects*. Le Cahiers de l'Archéologie en Nouvelle-Calédonie 15. Noumea: Département Archéologie, Service des Musées et du Patrimoine de Nouvelle-Calédonie, pp. 95-120.
- Hage, P. 1998. Was Proto-Oceanic Society Matrilineal? *Journal of the Polynesian Society* 107: 365-79.
- Hage, P. 1999a. Reconstructing Ancestral Oceanic Society. *Asian Perspectives* 38: 200-28.
- Hage, P. 1999b. Linguistic Evidence of Primogeniture and Ranking in Proto-Oceanic Society. *Oceanic Linguistics* 38: 366-75.
- Hage, P. and J. Marck. 2002. Proto-Micronesian Kin Terms, Descent Groups, and Interisland Voyaging. *Oceanic Linguistics*: 41: 159-70.
- Hage, P. and J. Marck. 2003. Matriliney and the Melanesian Origin of Polynesian Y Chromosomes. *Current Anthropology* 44 S5: 121-27.
- Hambrecht, P. 1932. *Ponape*. Ergebnisse der Südsee Expedition 1908-1910. Vol. 1 Hamburg: Friederichsen, De Gruyter.
- Hanlon, D. 1989. Micronesia: Writing and Rewriting the History of a Non-entity. *Pacific Studies* 12: 1-21.
- Hollan, D. and J. Wellenkamp. 1996. *The Thread of Life*. Honolulu: University of Hawaii Press.
- Hunter-Anderson, R. 1991. A Review of Traditional Micronesian High Island Horticulture in Belau, Yap, Chuuk, Pohnpei, and Kosrae. *Micronesica* 24: 1-56.
- Intoh, M. 1981. Reconnaissance Archaeological Research on Ngulu Atoll. *Asian Perspectives* 24: 69-80.
- Intoh, M. 1990. Ceramic Environment and Technology. *Man in Oceania* 6: 35-52.
- Intoh, M. 1996. Multi-Regional Contacts of Prehistoric Fais Islanders in Micronesia. *Bulletin of the Indo-Pacific Prehistory Association* 15: 111-17.
- Irwin, G. 1992. *The Prehistoric Exploration and Colonization of the Pacific*. Cambridge: Cambridge University Press.
- King, T. and P. Parker. 1984. *Pisekin Noomw Noon Tonaachaw: Archaeology in the Tonaachaw Historic District, Moen Island*. Micronesian Archaeological Survey Report No. 18. Carbondale: Center for Archaeological Investigations, Southern Illinois University.
- Kirch, P. 2000. *On the Road of the Winds*. Berkeley: University of California Press.
- Kirch, P. and R. Green. 2001. *Hawaiki, Ancestral Polynesia*. Cambridge: Cambridge University Press.
- Komatsu, K. 1990. A Sketch of Chieftainship on Pulpap. In I. Ushijima, (ed.), *Anthropological Research on the Atoll Cultures of Micronesia*. Tsukuba: Department of Anthropology, University of Tsukuba, pp. 21-34.

- Lawrence, P., M. Hadley, and R. McKnight. 1964. Breadfruit Cultivation Practices and Beliefs in Ponape. In J. DeYoung, (ed.) *Breadfruit Cultivation Practices and Beliefs in the Trust Territory of the Pacific Islands. Saipan: Office of the High Commissioner, US Trust Territory of the Pacific Islands*, pp. 42-64.
- LeBar, F. 1972. *Ethnic Groups of Insular Southeast Asia*, Vol. 1. New Haven: Human Relations Area Files Press.
- LeBar, F. 1975. *Ethnic Groups of Insular Southeast Asia*, Vol. 2. New Haven: Human Relations Area Files Press.
- Lingenfelter, S. 1975. *Yap: Political Leadership and Change in an Island Society*. Honolulu: University Press of Hawaii.
- Mackenzie, J.B. 1960. *Breadfruit Cultivation Practices and Beliefs in the Marshalls Islands*. Anthropological Working Papers, No. 8. Guam: Trust Territory of the Pacific Islands.
- Marck, J. 1986. Micronesian Dialects and the Overnight Voyage. *Journal of the Polynesian Society* 95: 253-58.
- Marck, J. 2004. *Some Ancient Clan Names of the Chuukic Speaking Peoples of Micronesia*. <http://rspas.anu.edu.au/linguistics/OceanicClanNames.pdf>
- Mauricio, R. 1987. Peopling of Pohnpei Island. *Man and Culture in Oceania* 3: 47-72.
- McKnight, R. 1960. *Breadfruit Cultivation Practices and Beliefs in Palau*. Anthropological Working Papers, No. 7. Guam: Trust Territory of the Pacific Islands.
- Nakayama, M. and F. Ramp. 1974. *Micronesian Navigation, Island Empires and Traditional Concepts of Ownership of the Sea*. Saipan: Congress of Micronesia.
- Nero, K. 1992. The Breadfruit Story: Mythological Transformations in Palauan Politics. *Pacific Studies* 15: 235-60.
- Nunn, P. 1994. *Environmental Change and the Early Settlement of Pacific Islands*. East-West Center Working Papers, Environment Series, No. 39. Honolulu: University of Hawaii.
- Parker, P. and T. King. 1981. Recent and Current Archaeological Research on Moen Island. *Asian Perspectives* 24: 11-26.
- Peoples, J. 1993. Political Evolution in Micronesia. *Ethnology* 32: 1-17.
- Petersen, G. 1975. Yams, Kava, and Picking Off Breadfruit. Paper presented at the Association for Social Anthropology in Oceania annual meetings, Stuart, Florida.
- Petersen, G. 1977. Ponapean Agriculture and Economy. PhD dissertation, Department of Anthropology, Columbia University.
- Petersen, G. 1982. Ponapean Matriliney: Production, Exchange, and the Ties that Bind. *American Ethnologist* 9: 129-44.
- Petersen, G. 1985. Ritually Changing the Seasons. In C. Bazerman, (ed), *The Informed Writer*, Second ed., pp. 378-84. Boston: Houghton Mifflin.
- Petersen, G. 2000. Indigenous Island Empires: Yap and Tonga Considered. *Journal of Pacific History* 35: 5-27.
- Pollock, N. 1974. Breadfruit or Rice. *Ecology of Food and Nutrition* 3: 107-15.
- Pollock, N. 1992. *These Roots Remain*. Laie: Institute of Polynesian Studies.
- Ragone, D. 1988. *Breadfruit Varieties in the Pacific Atolls*. Suva: Integrated Atoll Development Project.
- Ragone, D. 1997. *Breadfruit*. *Artocarpus altilis (Parkinson) Fosberg*. Promoting the Conservation and Use of Underutilized and Neglected Crops, No. 10. Rome: Institute of Plant Genetics and Crop Plant Research.
- Ragone, D. 2001a. Chromosome Numbers and Pollen Stainability of Three Species of Pacific Island Breadfruit (*Artocarpus*, Moraceae). *American Journal of Botany* 88: 693-97.
- Ragone, D. 2001b. Personal communication, 3/2/01.
- Rainbird, P. 2002. Pohnpei Petroglyphs, Communication and Miscommunication. *Bulletin of the Indo-Pacific Prehistory Association* 22: 141-45.
- Rainbird, P. 2003. Taking the Tapu: Defining Micronesia by Absence. *Journal of Pacific History* 38: 237-50.
- Rainbird, P. 2004. *The Archaeology of Micronesia*. Cambridge: Cambridge University Press.
- Raynor, W. 1989. Structure, Production, and Seasonality in an Indigenous Pacific Island Agroforestry System. M.S. thesis, Agronomy and Soil Science, University of Hawaii.
- Rehg, K. 1995. The Significance of Linguistic Interaction Spheres in Reconstructing Micronesian Prehistory. *Oceanic Linguistics* 34: 305-26
- Ross, M. 1996. Is Yapese Oceanic? In B. Nothofer, (ed.) *Reconstruction, Classification, Description*, pp. 121-65. Hamburg: Abera Verlag.
- Shutler, R. 1999. The Relationship of Red-slipped and Lime-impressed Pottery of the Southern Philippines to that of Micronesia and Oceania. In J-C Galipaud and I. Lilley, (eds), *Le Pacifique de 5000 a 2000 avant le present*. Paris: Editions de IRD (Institut de Recherche pour le Developpement), pp. 521-529.
- Stone, E.L. 1951. *The Agriculture of Arno Atoll, Marshall Islands*. Atoll Research Bulletin 6. Washington, D.C.: Pacific Science Board.
- Smith, D.R. 1983. *Palauan Social Structure*. New Brunswick: Rutgers University Press.
- Sudo, K. 1996. Rank, Hierarchy and Routes of Migration. In J. Fox and C. Sather, (eds), *Origins, Ancestry and Alliance*. Canberra: Department of Anthropology, RSPAS, Australian National University, pp. 55-69.
- Volkman, T. 1985. *Feasts of Honor*. Illinois Studies in Anthropology No. 16. Urbana: University of Illinois Press.
- Weisler, M. 1999. *Atolls As Settlement Landscapes*. Atoll Research Bulletin 460. Washington: Smithsonian Institution.
- Wilkes, C. 1845. *Narrative of the United States Exploring Expedition during the Years 1838-1842*, Vol. 5. Philadelphia: Lea & Blanchard.
- Yen, D. 1974. Arboriculture in the Subsistence of Santa Cruz. *Economic Botany* 28: 247-84.
- Yen, D. 1982. Southeast Solomons Cultural History. *Bulletin of the Indo-Pacific Prehistory Association* 3: 52-66.
- Zerega, N. 2003. The Breadfruit Trail. *Natural History*, Dec 2003-Jan 2004: 46-51
- Zerega, N., D. Ragone, and T. Motley 2004. Complex Origins of Breadfruit. *American Journal of Botany* 91: 760-66.