

**“When earth and sky almost meet”: The Conflict between Traditional Knowledge and Modernity in Polynesian Navigation.**

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**Abstract**

This paper provides an account of the differing ontologies of Polynesian and European navigation techniques in the Pacific. The subject of conflict between traditional knowledge and modernity is examined from nine points of view: The cultural problematics of textual representation, historical differences between European and Polynesian navigation; voyages of re-discovery and re-creation: Lewis and Finney; How the Polynesians navigated in the Pacific; a European history of Polynesian navigation accounts from early encounters; “Earth and Sky almost meet”: Polynesian literary views of recovered knowledge; lost knowledge in cultural exchanges – the parallax view; contemporary views and lost complexities.

**Introduction**

Polynesians descended from kinship groups in south-east Asia discovered new islands in the Pacific in the Holocene period, up to 5000 calendar years before the present day. The European voyages of discovery in the Pacific from the eighteenth century, in the Anthropocene era, brought Polynesian and European cultures together, resulting in exchanges that threw their cross-cultural differences into relief. As Bernard Smith suggests: “The scientific examination of the Pacific, by its very nature, depended on the level reached by the art of navigation” (Smith 1985:2). Two very different cultural systems, with different navigational practices, began to interact.

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Their varied cultural ontologies were based on different views of society, science, religion, history, narrative, and beliefs about the world.

The Oceanic Pacific basin covers a third of the earth's surface. If one excludes the landmass of New Zealand, the ratio of land to sea in the Pacific is one to five hundred. Ocean and wind currents move across the Pacific mostly in an east to west direction, yet the pattern of discovery and settlement in the islands by Polynesians since the Holocene was from west to east. Thus it was claimed the Polynesian ancestors in their voyages of island migration navigated against prevailing wind and against ocean currents. How was this possible without the possession of compass, sextant, chronometer or maps and charts? (Lewis 1994 [1972]:3).

It has recently been suggested that Polynesian maritime technology during the late Holocene migrations could not sustain windward sailing, and that the episodic patterns of initial island colonisation are consistent with periods of reversal in wind directions to the west according to the ENSO El Nino-Southern Oscillation (ENSO) pattern. The migrations during the period 3500-600 cal. BP took place according to El Nino frequency peaks when the easterly trade wind was minimised and westerly wind reversals more frequent according to the El Nino cycle (Anderson, et al. 2006:1).

Archaeological, palaeoenvironmental and linguistic data indicate phases of colonisation through the west to east Polynesia sea-gap (a distance of 1200 kilometres) at periods 400 to 1500 years apart: West Micronesia at either 3500-3400 cal. BP peak or at 4900-4600 cal. BP; migrations to East Polynesia at 1600-1100 cal. BP; North-west to Central Micronesia at 2400-2000 cal. BP; and westward dispersal from East to South Polynesia at 900-600 cal. BP (Anderson, et al. 2006:3).

Anderson suggests that a confluence of physical and ideological motivations led to maritime migration amongst Polynesians, including exile. Anderson claims that

changes of climate, operating through subsistence patterns, and extrinsic population densities led to episodes of migration motivated by political, religious, or other ideological differences. As he puts it: “In regard to the Pacific, the importance of exchange relations, of predatory expansion by maritime chiefdoms, or of planned migration by imperial policy, and of competitive migration as the expression of status relationships are propositions that emphasize the embedding of migration within the social landscape” (Anderson 2006:34). To make this claim Anderson cites archaeological evidence supporting an argument for differences in the distribution of religious practices in the wake of Polynesian migrations.

Polynesian navigators in their ocean-going craft engaged with the Pacific environment in what Europeans would call humanistic, metaphysical and phenomenological ranges of experience. These involved frames of reference in mentalist space which were of an oceanic, single-axis type involving long-term memory as well as intrinsic perceptions (Bennardo 2002:392, 405). That these navigational techniques were effective is evident in historical accounts from the eighteenth century, in ethnographic interviews and records from the late-twentieth century and from European and Polynesian attempts since the 1960s to recreate the voyages of Polynesian ancestors.

Polynesian navigators traversed the complex island network of the Pacific steering their ocean-going craft by celestial navigation, knowledge of wind and wave patterns and other environmental reference points such as the locations and habitats of marine mammals, ‘navigator birds’, and submarine phosphorescences.

European systems of navigation were based on maps, charts, logs, compass readings and chronological timekeeping. Whilst these could be mathematically manipulated as ‘long-range-distance’ navigational methods they were at the same

time reductive and worked on abstracted representations of the world that internalised specific and universalistic knowledge regimes derived in early European modernity. As John Law has stated: “Mobility, durability, capacity to exert force, ability to return—these seem indispensable if remote control is to be attempted. Indeed, they may be seen as specifications of a yet more general requirement: that there be no degeneration in communication between centre and periphery” (Law 1986:241).

Being representational, European techniques required less direct immersion in the environment than did Polynesian navigational techniques. Knowledge of ships’ positions was tied inextricably with co-ordinates and measurements from field instruments such as the compass, chronometer, and sextant. The measurements were recorded, enabling calculations of positions to be fixed in charts and logs. These measures resulted in a system of position finding, which, being representational and ship-bound, could be made at a remove from direct experience of the maritime environment. The abstracted remoteness of these techniques, coupled with the overwhelming economic advantage of the Europeans in the Pacific from the nineteenth century, resulted in the gradual occlusion of Polynesian navigational knowledge.

European presumptions of cultural superiority were based on economic advantage, technological differences, and access to natural resources, including metal technologies, which drove European industry. Implicit within eighteenth century European cartography was the centralised viewpoint of the modern subject. As the two cultures began to contest inhabitancy, trade within, and governance of the territories of the Pacific, this led to cultural occlusions in the early meetings and exchanges; intercultural abrasions and misunderstandings; and erosions of indigenous knowledge as well as to cultural adaptations.

European and Polynesian cultures had different cultural systems and social hierarchies that reflected extensive ontological differences. Where Polynesian culture was rooted in custom, tribal lore and a form of kinship socialisation of a shared ecosystem, Europeans brought with them the knowledge of surveying and legal title. The two cultural typologies did not easily transpose or graft on to one another.

While Captain Cook's voyages of discovery in the Pacific were proscribed by instructions from the Admiralty and the Royal Society in Britain, with special regard to respecting Polynesian persons and property, earlier and subsequent voyages were not. The Royal Society went so far as to instruct Cook that the Tahitian Islanders enjoyed a form of territorial possession equivalent to legal occupancy, and thus any consideration of economic advantage should not result in harm to them. However, Cook was also under orders from the British Admiralty to assess the Pacific for imperial gain.

With the exception of Cook's visit to Tahiti on board *Endeavour* to observe the transit of Venus in 1769, the exploration of Polynesia by Europeans, including the discovery of Tahiti by Captain Wallis and the crew of *The Dolphin* in 1767, tended to overlook the fact that many of the Pacific Islands were already populated by cultures possessing complex kinship organisations. Both the earlier discoveries in the Pacific, by Dutch explorer Abel Tasman (1642), and by Wallis, were marred by violent encounters: peaceable cross-cultural exchange in the Pacific before and during the eighteenth century was never to be assumed without negotiation.

From the voyages of exploration onward, the European discoverers brought both knowledge of population superiority and material advantage to the Pacific. The differences in cultural understandings between European and Polynesian cultures in the opening up of the Pacific and the ontologies underpinning them need to be

assessed in the attempt to understand the conflict between traditional knowledge and modernity in the navigation of Polynesia.

In his book *East is a Big Bird*, Thomas Gladwin claims that the heuristic problem-solving strategies of Polynesian navigation are similar to those employed in ordinary aspects of modern life. The comparison Gladwin makes is between Polynesian nautical navigation and the tasks performed by an 'experienced driver' in Western culture, which he describes as 'routine' (Gladwin 1979:224). While Gladwin's notion that abstract thinking is involved in the cognitive strategies of Polynesian navigation is superficially true, that thinking is not of the same ontological order as the more remote representational thinking of European navigation, and is far removed from the mechanical procedures involved in driving a car. As Bennardo's discussion in 'Map Drawing in Tonga, Polynesia: Accessing Mental Representations of Space' has shown, Polynesian mental representations of space were variously of the relative, intrinsic and absolute types (Bennardo 2002:392). A single-axis oceanic and intrinsic frame of reference system, which is centred on an object even when the speaker or object moves, was predominant in Polynesian marine navigation and used in combination with the relative (person-centred) and absolute (fixed-point) types.

Whilst Polynesian navigation techniques have regard for every possible contingency through the maritime journeying, it is through a form of inhabitancy in the phenomenological realm that they are different from equivalent European navigational techniques or those of a modern automobile driver, unlike Gladwin's analogy. Polynesian navigational understanding was premised on a much deeper engagement with the phenomenological world and a much more complex series of mentalistic referents than Gladwin allows. Similarly, this paper will take issue with the notion of a divide between 'primitive' and 'modern' in discussing Polynesian and

European cultures that is based on anything other than the historical and geographic accident of access to and ability to refine differing geographically distributed material resources.

The hegemony of the West in the Pacific was achieved by the overwhelming factors of European population numbers and economic expansion based on possession of material resources and the technology to transform them. Ultimately, European navigation was not in a sense revolutionary in the Pacific. Polynesian techniques, although dissimilar in kind, were nevertheless effective for Polynesian purposes.

### **Cultural problematics of textual representation**

Knowledge of the Polynesian navigation system is today largely available through the interpretation of records and narratives recorded in the language of the coloniser, although indigenous beliefs and practices remain inter-threaded in these cross-cultural records of European and Polynesian cultural memory. European and Polynesian cultures may be drawn to one another in the attempt to enhance their own and each other's cultural understandings, to gain new insights concerning ontological differences between navigation techniques, and also to problematise the politics of cultural occlusion in the attempt to recapture lost knowledge.

Navigational knowledge in Polynesian culture was traditionally the province of *orio* or navigation priests and was transmitted in a selective way through oral teaching and learning. Such teachings penetrated the narratives of Polynesian cultural memory with few instruments used to support this knowledge, (although etak dead-reckoning charts and maps representing island locations and currents were fashioned from available timbers, twine and shells).

In the attempt to record and recapture Polynesian navigation methods and to examine ontological differences between the Polynesian and European thinking that produced them, both cultures may be aware of complex issues concerning identity and representation that arise from cross-cultural exchanges. One must attempt to construct a discursive space in which agency may be negotiated between both cultures. There is no easy way around this dilemma other than to attempt to place the historical validity of Polynesian navigational knowledge in the foreground and to attempt to elucidate the historical and textual conditions under which such knowledge became known to Western culture. In so doing one needs to ensure the cultural freight of this textual traffic is not one-way. Analyses of post-contact literatures reveal the nature of cross-cultural exchange and in so doing renegotiate the politics of cultural identity. As Manuka Henare puts it in the context of exchange between European and Maori religious views: “[T]he time is coming when we will stop translating Western Christianity into Maori terms and begin to translate Maori Christianity into Western terms” (Henare 1983).

For Polynesian culture, texts published in a European context may remain “alive to the risk of using a colonial or globalising medium to express indigenous content” as Phillip Armstrong has put it (Armstrong 2003:22). However, code-switching between languages, and issues of appropriation, have been occurring with cultural and language changes in the Pacific since the eighteenth century meetings of the two cultures. Polynesian culture inhabited a dramaturgical space parallel to European time; however, entry into modernity meant Pacific culture was increasingly governed by European history and the mythical structure of indigenous narratives that became entangled with those of European historicity.

The exchange of cultural knowledge in the Pacific necessitated the adoption of European communicative practices; however cultural knowledge is intrinsically involved in issues of identity in which the medium of expression exists in a suspended state of oscillation between cultural referents. Contemporary examples of this ontological difference are illustrated by the concepts of mana and tapu. Cultural lore may circumscribe the recording of cultural knowledge in one or other medium, for example, Polynesian whakapapa or genealogical trees on the internet. The Polynesian view is that such knowledge should be handed down in person. This problem is explored by Robert Sullivan in his poem '54 waka rorohiko':

*54 waka rorohiko*

I heard it at Awataha Marae  
in te reo – waka rorohiko –  
'computer waka', about a data base  
containing whakapapa. Some tapu  
information, not for publication.  
A dilemma for the library culture  
of access for all, no matter who, how,  
why. A big Western principle stressing  
egalitarianism. My respects.  
However, Maori knowledge brings many  
together to share their passed down wisdom  
in person to verify their inheritance;  
without this unity our collective knowledge  
dissipates into cults of personality (Sullivan 1999:59).

Sullivan's poem addresses the idea that knowledge of Maori whakapapa is tapu and person-centred; spiritual qualities cannot be captured in digitalised form, which may be accessible to all. The principle of democracy contained in the European concept of knowledge available to all on the internet is challenged by the notion of 'sanctity' expressed in the oral transmission of Maori knowledge. Sullivan's argument iterates

that knowledge has a tapu and provenance that is bound up with an ontology or with kinship ties that may be ignored by the abstracted representational form of digital culture.

One of the main differences in forms of cultural knowledge between Polynesian and European navigational systems is expressed in terms of ‘ontological immediacy’ and direct inhabitancy of the natural or phenomenological world. European representational techniques of navigation since the early modern period had worked on successive refinements that enabled ‘long-distance control’ involving forms of record and representation different from Polynesian methods that involved star-lore and narrative recall, and atypical of Polynesian representations of space. While this enabled a form of technical universalism for the European it also represented a form of detachment from aspects of the phenomenological environment better known to Polynesians. Arguably the phenomenological qualities of the Polynesian navigational visual field made it richer and more detailed than Europeans required. With few mnemonic devices the Polynesians retained complex mentalistic narratives in long-term memory.

Polynesian navigational systems required knowledge and ordering of the natural world. Polynesians had direct access to their marine environment and its archipelagos, unmediated by forms of representation such as the maps, charts and logs available to the European. European systems of representation and long-distance control enabled a selective engagement, which internalised the outside environment on board their vessels in the forms of charts, logs, compass bearings, and readings of latitude and longitude. Thus a path could be steered through the seas by Europeans without the need to refer to any but the basic phenomenological forms of the ocean around them. There were concerted efforts from naturalists, including Banks and

Forster, who accompanied Cook, to classify the flora and fauna they encountered in the Pacific in the taxonomic style of Linnaeus. However this was done against a static background of scientific categorisation and display, rather than the evolving natural world of the Pacific. Indigenous flora and fauna was re-contextualised into the display cases of Europe and had little to do with ocean navigation.

Other forms of natural ocean referents such as homing birds, the presence of marine animals, submarine phosphorescence, and swell deflections, which were important to Polynesian navigation, were regarded as largely peripheral and incidental to the European technique. Whereas Cook recorded the positions of *Endeavour* in his journal from plots on charts and maps as was the European norm, Polynesian navigators relied on memory, the night sky and the patterns of wind and sea-swells, a form of phenomenological engagement involving mentalistic recognition and manipulation of physical referents augmented within ancestral narratives.

European technology mediated in representational terms between knowledge of the marine environment and people's place within it, in an attempt to render, from a central viewpoint, three dimensions into two under the civilising gaze of the modern European subject. However, these two dimensions were prioritised at the expense of a form of relational knowledge of the phenomenological environment. There was no such ship-bound internalisation for the Polynesian navigator. Ontological understanding of Polynesian navigation requires a cultural adjustment involving a suspension of the reductive representational aspects of European navigational techniques. It needs understanding of the oceanic environment and faith in its ability to provide the signal referents in ecological terms that can be interpreted both to determine position and to provide passage from one Pacific island region to another.

A problem remains. If accessing different cultural practices is a matter of selectivity and textual construction, the discursive medium is inherently culturally political. While descriptive agency may be wrested from the world of living agency into the textual domain, in doing so the political economy of cultural exchange must also be negotiated.

While European navigational techniques involved abstract two-dimensional representational forms, Polynesian techniques were not ship-bound. The navigator did not distinguish between the modern sense of self and the environment in an abstracted sense. The success of European navigational techniques was premised on the ability to make volume two dimensional; to reduce the complexity of the phenomenological world along the reductive axes of space and time into mathematical co-ordinates on maps and charts. To accomplish this, the reductive properties of magnetism were employed, as well as the regulatory principles involved in the production of mechanical time, with its linear referents that were only partly based on cosmic ordering. The centralised viewpoint of the European system was relative to ship-bound representation. As Anne Salmond puts it in *Two Worlds*: “While Polynesian navigators relied essentially on the oral transmission of sailing directions and navigational information, European navigators communicated more commonly by means of documents— texts, tables and charts— that recorded the cumulative results of astronomical observation, mathematical calculation and experience at sea” (Salmond 1993:69).

Polynesian navigational techniques were based on a complex system of physical signs, markers and symbols, a system founded on a priori and a posteriori assumptions from the inhabitancy of the phenomenological world. It was also a system in which past, present and future were inter-connected in narratives of

creation and transformation, rather than the suspension of time in a synchronic present deferred between past and future and encapsulated in maps and charts, as was European practice.

Polynesian navigation was based on fixed and contingent spatial knowledge of the Pacific environment, the sea and the sky. It relied on few external instruments, needing only the navigator's knowledge of the phenomenological world and stick charts representing island positions and sea-swells. There were at least eight kinds of sea-swell in the Pacific (Addis 2004).

Although accounts of early modern European navigation techniques that preceded the Harrison chronometer, and of Polynesian star-compass methods, show they shared an affinity, the latter suffered displacement and occlusion. However, Polynesian navigational practices were retained in one form or another, in Mace Island and Pullulate Atoll, for example, in preference to European techniques, until from the 1960s there has been European interest in their revival.

Polynesian accounts of pre-European navigation may be pieced together as a mosaic. It is inherently problematical to provide a definitive or comprehensive account of Polynesian navigation, because Polynesian knowledge is traditionally oral in transmission and contained in the heads of those privileged with it, rather than in written documents.

Most records of Polynesian oral explanations of their culture of navigation have been made by Europeans; important ontological complexities may be overlooked in the translation because of European narrative conventions. However, the efficacy of Polynesian navigational techniques is recorded in early ethnographical writings about the experiences of the explorers of the Pacific; and in historical anthropological accounts. They have been tested on various voyages since the 1960s

by resourceful educators, practitioners and sailors such as David Lewis and Ben Finney, who, working with keepers of traditional Polynesian navigational lore, made reconstructed journeys in the Pacific using Polynesian navigational techniques.

Inherent also in any cross-cultural encounter are the complexities derived from cultural differences, which may be conceptual in nature. The attempt to translate, record, and communicate such knowledge changes it. Various adaptations were made by Polynesians to European techniques and culture. Apart from the design of native instruments, such as star charts, Polynesian knowledge was transmitted through oral lore, whereas European knowledge is inherently located in physical documentation and representational form in maps and logs. This democratised knowledge, making it less selective and occult. The European system was universal insofar as anyone with sufficient time and materials could learn it. Europeans simply didn't know how to navigate like the Polynesians, but they knew how to do things differently.

If there are two devices of European technology responsible for the occlusion of Polynesian navigational techniques, they are the Harrison chronometer, which gave more accurate measures of time, thus enabling longitudinal measurements to be made more precisely; and the compass, which works using the laws of magnetism. The chronometer and compass were largely instrumental in eclipsing Polynesian navigational knowledge because they universalised navigational knowledge and put knowledge of the Pacific in modern European terms. However, at the time of the eighteenth century voyages of exploration, for Polynesian purposes, travel between Pacific Islands was faster aboard Polynesian outrigger vessels. These vessels, such as the double-prowed sailing canoe or *alia* (Fig. 1.) have seen continuous use. However, modern European population pressure overwhelmed Polynesia economically.

European instrumentation, cartographic techniques and documentation were readily reproduced and could be exchanged independent of Polynesian knowledge of the phenomenological world.

Anne Salmond has commented on the different ‘fields of action’ within the Pacific and the European systems of ‘long-distance control’. She has also commented on the two-dimensionality and reductiveness of the European approach:

. . . as they sailed through the Society islands, the sailors exercised another kind of power, charting the islands and surrounding ocean, transmuting them into gridded lines of latitude and longitude, stripped of substance and emptied of people. This alchemy was effective, because as successive European crews visited the archipelago, raising flags, conducting ceremonies of possession and giving new names to the islands and settlements, they often seemed unaware that they were in seas traversed for centuries by others, “discovering” and claiming places that had long been inhabited (Salmond 1993:69).

For Europeans, knowledge of Polynesian migration is gathered from oral history and ethnographic accounts pieced together from human archaeology and biotic data – the piecing together of fragments of knowledge. It is complicated by cultural differences among Polynesians descended from Micronesia and South East Asia living in the complex scattering of island archipelagos.

The navigational techniques of Maori may have become less practiced as they became historically acclimatised to Aotearoa; settlement brought cultural refinement but altered the kinds of knowledge stored in cultural memory. Knowledge of near-coastal fishing grounds replaced that of long-distance voyaging. As Anne Salmond puts it in *Two Worlds*: “Very little is known about early Maori deep-sea navigational techniques, and perhaps our best chance of understanding their seafaring methods comes from Polynesian voyaging, and the studies of navigational systems in Micronesia, where related traditional techniques have continued to be used into

modern times” (Salmond 1993:69). Polynesians who were part of the diaspora inhabiting the archipelagos of the Pacific of necessity retained elements of their pre-European navigational techniques until after the advent of modern European culture. However, settlement of Aotearoa after the CE twelfth century had obviated the need for constant updating of navigational knowledge among Maori, with narratives of journeying and settlement taking priority over navigational lore.

Furthermore, Polynesian navigational techniques could be described as ‘deep sky’ as much as ‘deep sea’. Maori creation myths contain elements of each in the stories of Kupe, Kawariki, Maui, Tawhirimatea (god of storms and winds), Tangaroa (god of the sea), Punga, Ikatere (father of fish), and Tu-te-wehiwehi (ancestor of reptiles). Maori knowledge of fishing grounds became extensive following the settlement of Aotearoa. Fishing involved near-ocean journeying in waka, but long-range oceanic voyages were remembered in ancestral storytelling and became part of the narratives of settlement, celebrating the mana of the ancestors or of their eventual passing and return to Hawaiki. When Tasman and Cook encountered Maori on the voyages of European discovery, Maori did not know which of their own myths to connect them to. As Anne Salmond puts it in *Two Worlds*:

When the first European ships arrived in the islands, these strange craft provoked wild speculation. Some people thought that they had sailed down from the sky, or from beyond the arched heavens which encircled the islands. Others thought that these were floating islands, impelled by ancestral power, or vessels from Te Po, the realm of ancestors, the past and the future (Salmond 1993:69).

If there was some similarity between traditional Polynesian navigational techniques and those of Europeans before the late eighteenth century, the introduction of the Harrison chronometer (of which *Endeavour* carried four versions) on Cook’s second voyage enabled a more accurate measurement of longitude, which further

increased European 'progress'. Cook referred to the watch as: "Our faithful guide through all the vicissitudes of climates" (Sobel 1995:50). So it was the ability to record the passage of time accurately and to use it to calculate speed and distance travelled, as well as the translation from three dimensions into two, which would put "the phenomenal world, in all its thick rotundity . . . under the sway of . . . sovereign geometrical vision" (Armstrong 1995:2).

There is little evidence that either Europeans or Polynesians attempted to discover or record each other's systems in early encounters. European navigation was internal to the ship's working. However, in Polynesian culture navigation was person dependent, and the boundaries between self and environment were less defined. There was, however, a limited form of exchange between cultures. As Salmond points out, Tahitian navigators in the eighteenth century boarded European ships, piloted them safely between the islands and reached a kind of understanding with European captains.

Any account of navigation in the Pacific will say that many narratives of navigational techniques have been 'lost'. Even within Polynesian culture, navigational techniques were exclusive. Despite the compass being more readily available to them by the twentieth century, many Islanders chose to navigate by the stars, and did so well into the twentieth century even after the introduction of the outboard motor.



Fig. 1: Double-prowed sailing canoe or ‘alia 1890-1910: Andrew Thomas (photographer) (photograph provided by Museum of New Zealand).

Philip Armstrong has suggested that white settlers in the Pacific are afflicted by a form of amnesia following from ‘deliberately forsaken origins and the willed impossibility of return’ as they settled in the Pacific. While this may be true for the impact of modernity on Polynesian culture (for the act of remembrance in another culture is difficult without a history of cross-cultural exchange), it is not true either for eighteenth century or contemporary travellers, or for the new historical accounts of navigation from contemporary scholars as they attempt to re-agentify the discourse of Pacific navigation. Rather than define memory in racial as opposed to cultural terms, this would perhaps be better stated that any form of cultural dislocation or transplantation will affect cultural memory to the extent to which new influences can be connected with old (Armstrong 2003:23).

### **Historical differences between Western and Polynesian navigation**

As Salmond states, “Way-finding at sea is a complex art, and Polynesian and European voyagers accomplished this in very different ways, based upon divergent assumptions about the ocean, cosmos and persons” (Salmond 2005:67). Historically, Polynesian and European navigational techniques were of different ontological kinds, pursuing different kinds of knowledge. Where the Polynesian system made use of a complex array of external environmental referents, the European system was abstract, representational and largely internalised on board vessels. In the northern hemisphere mariners fixed their course by the two ‘guards’ and the Pole Star in the constellation of Ursa Minor. As Philip Armstrong explains:

The astrolabe (or one of its variants, the quadrant, sextant or octant) was employed by mariners to fix their position vis-à-vis these stars; and by Elizabethan cartographers to plot latitude on land, situating their position according to the height of the sun or the Pole Star above the horizon at the place of observation. An accurate point on the map could be plotted only when the eye was lined up, via the optical instrument, with the astronomical referent (Armstrong 1995:6).

The range of stars visible to the naked eye was different in the southern hemisphere.

The Southern Cross and Matariki were the two principle groups of stars that guided Polynesian ocean-going craft to Aotearoa. Position finding on European ships was often a protracted affair. As Salmond explains of Dutch explorer Abel Tasman:

“...Tasman was used to sailing in unknown or inaccurately charted waters, and like all of the Company’s captains he consulted closely with his senior officers in calculating the latitude, shooting the sun, checking the variation of the compass, altering course and, in the case of disputes, settling the matter in a full meeting of the ship’s council” (Salmond 1993:68-69).

Polynesian navigators used direct observation of phenomenological references such as the changing positions of sun, star, wind, and sea signs, whereas European sailors located ship positions on an abstract grid, divided into degrees of latitude and longitude, at measured intervals that orientated them in a position relative to true north.

Perhaps the best historical evidence of these differences is provided in the cross-cultural exchange between the persons of Tupaia and Cook, recorded in the accounts of the second voyage of *Endeavour* in the Pacific. Tupaia was an ariori of the cult of Oro from Ra'iatea, a society of orators, priests and navigators who accompanied Cook after the observation of the transit of Venus from Tahiti. Tupaia produced a chart for Cook delineating the positions of one hundred and thirty islands known to him in the vicinity of Tahiti, and helped navigate the ship through the Tahitian Islands. As Finney and Low explain: "After the transit of Venus, he [Tupaia] guided *Endeavour* some 500 miles (804 kilometres) from Tahiti through the Leeward Societies, and then from Ra'iatea south to Rurutu in the Astrals" (Finney and Low 2006:165).

Naturalist George Forster stated in his journal in 1777 that in Tahiti there were "few men who preserve the national traditions" (Forster 1777:148), but Tupaia was one of them. Forster's journal also tacitly suggests, in passing, the importance placed on navigational knowledge by ascribing to the Polynesian society of Tahiti the notion of nationhood, no doubt derived in part with mind to the 'civilising' instructions of the Royal Society. Forster's narrative records the discursive hegemony of encounter, rendering Pacific tradition in an already historical context. However, Polynesians were proficient navigators. Forster's journal states that "...he [Tupaia]

was never at a loss to point at Taheitee at whatever place he came” (Forster 1778 cited in Richey 1974:114).

The numerous European vessels that followed in Cook’s wake did not always have the backing of the Royal Society. They would have been largely ignorant of Polynesian lore and customs, or have gained knowledge of them without previous instruction or a policy that sought to preserve cultural differences. As David Lewis suggests, “[The] very idea that people without instruments, charts or writing could have developed an elaborate and effective art (or pre-science) was so utterly foreign as not even to enter the minds of most Europeans. With few exceptions they were satisfied with rather vague statements about using the stars, sun, and the waves as guide, though the vehicles of voyaging, the big canoes, were somewhat more closely studied” (Lewis 1972; 1994:9).

This argument is contradicted by such early twentieth-century accounts as those in Elsdon Best’s *Polynesian Voyagers. The Maori as a Deep-sea Navigator, Explorer and Colonizer*, which accept Polynesian migration legends as if they were ‘literal history’. Best’s discourse from 1923 is, however, flawed because of Victorian ethnographic attitudes. It tends to equate the Polynesian narratives of myth with those of ocean-going drift and one-way voyages. In the discourse of Best’s critique, the discursive narrative mirrors the historico-mythical journey of Pacific voyaging. However, Best’s accounts tend to elide the complex phenomenology of the voyaging sagas with a European sense of the poetic and allegorical, rather than be presented as an objective comparison of methods of navigation. The neat cultural sidestep that Best’s ethnography enacts is a way of avoiding an ontological engagement with the Pacific and is in a sense a form of cultural reflection that makes no attempt to penetrate what it regards as a veil of superstitions about the Polynesian Pacific.

Victorian ethnographers were highly inconsistent in their attitudes towards the Pacific. Best's narrative adopts the patina of neoclassical European Romanticism. The backdrop to the European view was the cultural clamour of Europe.

Whilst Europeans tended to resist scientific engagement with Polynesian navigational ontology, they did subsequently blend ethnographic accounts with perceived ideas of the mythic-structures of Polynesian lore in accounts such as Elsdon Best's from 1923. Where Europeans incorporated Polynesian narrative to some extent, they did not always do so sympathetically, but reflected value-laden misreadings whereby Polynesian culture was prejudiced in terms of European values. The process of cross-cultural encounter and exchange did not always result in the exchange of shared values and perceptions. Polynesian village life was not regulated by the European time clock. It was too easy for Europeans, used to the bustle, economic supremacy, expanding populations, and industrial modernity of Europe, to view Polynesian life as 'sauntering' as Best does, when in fact Polynesian societies subsisted within the natural timescapes of their own natural ecologies.

It wasn't just abstract co-ordinates, but a complexity of phenomenological signs that the Polynesians responded to as they traversed the oceans. These signs could combine in complex inter-relationships of wind, ocean and sky. The differences between navigational ontology are best illustrated along the continuum of inhabitancy. Polynesian navigators were 'immersed', they occupied the physical environment in super-natural experiential ways, whereas, as John Law puts it, the navigators of (medieval) European vessels were "...physically mobile, forceful and durable only while they stayed within the envelope generated by rutters and charts. Or, to put it somewhat differently, they were undisturbed by their external

environment only so long as they were able to transfer that environment inside themselves in the form of charts, rutters and the rest” (Law 1986:241).

Whilst, as Law explains, the navigators of medieval Portuguese vessels were used to telling the time by means of referencing the Pole star and its surrounding cluster, which sank towards the northern horizon when the vessels were sailing south, European long-range navigation techniques involved the incorporation of an internalised astronomical context that led to the extension of its mobility and durability (Law 1986:251).

Early Polynesian navigation techniques, although involving mentalistic computations, were far from being abstract. Familiar stretches of ocean, sea paths and sea marks were located under a horizon of stars as they rose and set in the direction of the vessel’s destination. Sea swells and patterns of deflection off islands meant the navigator could detect an island that was still below the line of the horizon; land signs were visible at a radius of 320 kilometres and sometimes the radii of islands would interconnect. The presence of islands was signalled by wave fronts which bent around island swells. These lessened in shallow water, and the reflected wave, called the ‘te ngaru whenua or land wave, could be visible up to 24 to 32 kilometres offshore. Furthermore, cloud shapes reflecting a green underbelly indicated the presence of land, which was also signalled by flights of birds at dawn or dusk, rising from fishing grounds. This required not just the sighting of single birds, but repeated observations of adult land-nesting ‘navigator’ birds. Underwater luminescence indicated the presence of land within a radius of 24 to 32 kilometres. Flat stretches of water also indicated the presence of land, which blocked trade-wind sea-swells. Conversely, areas of persistently rough water might indicate islands by the vectors of sea-swell deflections. The sightings of ‘flotsam’ or sea creatures living in particular places

could indicate proximity to islands, with feeding beds raised from the sea floor by coral reefs. Subsequent to the voyages of colonisation it was rare for islanders to travel more than 500 kilometres between islands (Adds 2004).

More than this, for both near and long-range voyaging, the Polynesian navigator memorised past, present and future through narratives of ancestral deities. Salmond and Finney make reference to Tapaia uttering chants to call on ancestral power. These narratives, the purpose of which was in part to focus the mind, also contained ancestral lore expressing knowledge of sea gods and star gods, who guided the winds and providence of ocean-going vessels. Finney provides an example of a *karakia* that accompanied the launch of the *Hawi'iloa* in Hawaii in 1993:

Ia wa'a nui	That large canoe
Ia wa'a kioloa	That long canoe
Ia wa'a peleleu	That broad canoe
A lele mamala	Let the chips fly
A manu o uka	The bird of the upland
A manu o kai	The bird of the lowland
'I'wi polena	The 'I'wi polena bird
A kau ka hoku	The stars appear
A kau I ka malama	The daylight arrives
A pae I kula	Land ashore
'Amama ua noa!	'Amama, the kapu is free! (Finney, 2003, 29).

At sea, wind compass directions, trajectories of sun and shadow cast by the mast of the outriggers; and other points such as celestial paths provided by a series of stars that rose in progression to a point or bearing on a distant island, were also used. Estimates of distance travelled were made in terms of nights elapsed and by 'dead reckoning' between star reference points. Star, wind, and current patterns were memorised for the return voyage. As Salmond puts it, "During such expeditions the navigator slept as little as possible, ceaselessly scanning the sea and the night sky and keeping watch for land clouds and homing birds" (Salmond 2005:176). This would frequently leave the navigator with bloodshot eyes, which added to the aura of

supernatural concentration. This image of the Polynesian navigator finds an entertaining corollary in Jonathan Swift's eighteenth-century satirical fable, *Gulliver's Travels*. Swift describes the Laputans thus: "Their heads were all reclined either to the right, or to the left; one of their eyes turned inward, and the other directly up to the zenith. Their outward garments were adorned with the figures of suns, moons, and stars..." (Swift 1995 [1726]:119).

Polynesian navigational knowledge was also conditional and adaptable. The oriori did not have abstract representational forms of knowledge displayed on charts. For the Polynesian navigator, the planet is a living force. European techniques, remote and long-range, as well as providing a traceable record of the voyage freed valuable time for botanical, anthropological and artistic reflection. Representational methods therefore made it easier to establish control over the environment and simultaneously were asserted in a medium that was intrinsically tied to the power relations of European culture.

Island navigators' piloting European ships provides evidence of an intermediary stage between the indigenous knowledge of Pacific navigation and European practice (prior to the introduction of the Harrison chronometer). Where Europeans had a complex array of scientific instruments, Polynesian navigators relied on their wits and senses, more in tune with the phenomenological world with which the individual has direct consort, rather than having the world mediated through instrument and representation. As Salmond points out, a portable observatory was set up, on Tahiti for example, to measure the transit of Venus: "an array of surveying and astronomical instruments including a theodolite, a plane table, a brass scale, dividers, parallel ruler, proportional compasses, several telescopes with stands, a Dolland's micrometer, an astronomical quadrant, several thermometers, a barometer and three

clocks were supplied by the admiralty and the Royal Society” (Salmond 1993:101). Such instrumentation was largely foreign to Polynesian culture before the encounters of the eighteenth century.

Furthermore, time is experienced differently in European culture. It becomes one axis to plot on a graph, which also measures and verifies distance travelled in ratios of ‘collapsed’ space. It can be contrasted with the synchronicity of Polynesian time, which sees past and future as part of the narratological present. This independent verification, provided by textual and cartographic representation, highlights the complexity of the Polynesian model. The Europeans sought measurements from the heavens in order to arrive at mathematical calculations of position, derived in part through the use of a magnetic compass. The Polynesians had no such compass and limited maths. They were capable of understanding and interpreting a more highly developed and complex array of signifiers from the phenomenological world than were the Europeans. Polynesian navigators could rely upon such signifiers in the Pacific in a way impossible in European waterways. Access to metals and mining materials in Europe had produced a different kind of environmental engagement and a different ontological understanding of the various relationships among the fabric and life of the cosmos.

Prior to the invention of the chronometer, Europeans determined position at sea by ‘dead reckoning’. This involved determining a calculated course based on compass bearings; measurement of distance and time made by ‘chip log’ and hour glass; and estimates of current and leeway. Polynesians also used a form of ‘dead reckoning’. There are brief accounts of it from the European perspective—Forster’s account of Tupaia, who throughout Cook’s journeys in the South Pacific always knew where Tahiti was; and David Lewis’ account of Mau Piailug, who navigated the

voyage of the *Hokule'a* from Rarotonga to Aotearoa in 1976. The path steered from the islands to Aotearoa was travelled by keeping to the left of the sun during the day and between the Southern Cross and Matariki by night.

While the Polynesian calendar was attuned to the natural rhythms of the day, in the context of seasonal understandings, with star and wind positioning based on ancestral lore, the Europeans, following the chronometer, could divide time into minutes and seconds, thus enabling accurate longitudinal readings to be made so they could follow routes determined by bearings drawn from compass positions. The speed of European ships needed to be computed daily over smaller distances. This was done, as Salmond describes, by 'chip log', which also formed a part of the official record of voyage (Salmond 2005:177). A triangle of wood at the end of a rope knotted at regular intervals, was thrown overboard until it floated beyond the ship's wake; a half-minute glass was then upturned as the rope ran freely from a wheel. The number of tagged knots unreeled as water ran through the glass was counted to compute the ship's speed.

For the Polynesian navigator, ship-bound abstractions were part of a mentalistic narration using intrinsic frames of reference rather than a system of externalised representations. The chronometer and the method for calculating speed put Europeans in a central position in their journeying narrative. The Polynesian however, is either a part of the environment he is sailing in, so notions of self disappear, or he is playing a role in his ancestral narratives, with his ability to read the environment determining the variations of the story told. As Salmond puts it: "Rather than a system of long-distance control, this was a system of exploration and settlement by kin-based relocation" (Salmond 2005:249). However, little is known of the children descended from Tupaia, or other navigator priests or oriori.

### **Voyages of re-discovery and re-creation: Lewis and Finney**

There have been successive attempts by Europeans and Polynesians to rediscover or re-investigate ancestral navigational technologies. The purposes of these attempts have been as experiments in voyaging; for cultural revival; and to recreate and test Polynesian navigational techniques. The attempts have been led by New Zealand doctor and sailor-explorer, David Lewis, and Hawaiian anthropologist, Ben Finney. Both have been responsible for bringing to wider attention the attempts since the 1960s to recover and to investigate the validity of Polynesian sailing techniques, as part of a Pacific cultural renaissance.

One such journey was that of the *Hokule'a*, steered by traditional navigational techniques from Hawaii to Tahiti, a voyage of 2500 miles (4000 kilometres), under the guidance of Micronesian navigator Mau Piailug. As Lewis described the purpose of the journey: "Any experiment involves isolating factors to be investigated. Our purpose was to test the accuracy of star and sun steering by eye alone, and the use of zenith (that is, overhead or latitude) stars, in a situation where other relevant factors were equivalent, though not precisely the same, as the prehistoric voyage" (Lewis 1994 [1972]:21).

Lewis's choice of language is interesting here. Polynesian voyaging was only "pre-historic" in the sense of being undertaken independently of European culture. One example of Polynesian navigational techniques Lewis gives is that of a Polynesian star compass in the Carolines (from 1935). However wind compass and zenith star steering, known to have been used by Polynesian navigators, were also used, though not in the Carolines. Cultural occlusion mars the attempts to revive Polynesian navigational techniques. Polynesian narratives of navigation, because they are spread amongst the many Polynesian islands, are difficult to integrate within a

holistic picture. Consequently it is difficult to re-create exactly the conditions and techniques under which Polynesians navigated.

However, added to the example of the Carolinian star compass are techniques of wave orientation, the etak or moving reference island system, the 'expanded' target concept and zenith star concepts (Best 1923:127). These, Lewis suggests, have survived because they are straightforward, such as steering by horizon stars, or so incompatible with European systems as to allow of only minor modification, and therefore remain intact as techniques until they are replaced completely. Writing in 1971, Lewis could state that in Puluwat, one of the Caroline Islands in Micronesia, ancestral sailing directions were still being taught in traditional navigational 'schools' (Lewis 1994 [1972]:25).

Lewis also states that Polynesian navigators never referred to any form of sixth sense. A navigator could determine that land lay over the horizon because of the sequence and quality of certain phenomenological and environmental signs, not because of premonition or guesswork.

Polynesian craft were smaller than European vessels, mostly between 30 and 70 feet long (nine to 20 metres), and divided into two classes: the double hulled wa'a-kaulua, and pahi; and the outrigger vaka tou'ua. European barks and clippers were sometimes over a hundred feet (30 metres) in length, and travelled between four and six knots, whereas the Polynesian vessels were much faster and more manoeuvrable and able to travel at speeds of up to 17 knots.

As the introduction to David Lewis's text reveals, from the outset of encounters in the Pacific in the seventeenth and eighteenth centuries Europeans had different ideas concerning the exclusivity of navigational knowledge. Lewis cites Winkler as stating, in 1901, of navigational lore in the Marshall Islands, that it was

“strongly and religiously forbidden to divulge anything concerning this art to the people” (Winkler 1901:505). Within Polynesian culture, oceanic navigational lore was restricted to a few.

Most attempts to recover lost navigational knowledge come from the mid-late twentieth century, which raises the question of the validity and authenticity of Polynesian accounts of voyaging, because of the pressures of European economic and cultural occlusion. Issues of authenticity in the present are combined with the difficulty of piecing together historical Polynesian knowledge, whose oral constructs are elusive and whose narrative structures resist confirmation. The late twentieth century re-creations tested the soundness of Polynesian navigational techniques through voyaging.

David Lewis is perhaps the leading exponent in the renaissance of Polynesian navigational voyaging. He used his 1965 voyage around the world in the *Rehu Moana*, ‘Ocean Spray’, and later the ketch *Isbjorn* to test academic theories about ocean navigation by ‘bringing them down to sea level’ and testing methods used by old-time Polynesians. Lewis canvassed 150 instructors, academics, administrators, and roving yachtsmen in the course of his practical research.

Lewis returned to the Carolines in 1973 and the Gilberts (now Kiribati) in 1976. He sailed in trials of the newly built 65-foot Tarawa *baurua Taratai*, which was sailed to Fiji using western navigational methods. In 1976 Lewis accompanied Ben Finney in Hawaii for the *Hokule’a*’s voyage to Tahiti using traditional navigational techniques. During these voyages Lewis consulted numerous outlier Polynesians, Santa Cruz Reef Islanders, Tikopians, Sikaianans, Western Polynesians, Micronesians, Micronesian-Melanesians, and Indonesians.

In *Sailing in the Wake of the Ancestors*, Ben Finney describes a re-birth of voyaging over twenty years in the *Hokule'a*, a modern replica of ancient voyaging canoes. Finney also registers the aura of doubt that surrounds even revivalist attempts to validate Polynesian knowledge. As he put it, there was awareness since the 1980s of “[T]raditions that claimed or appeared to have been developed long ago but had really been more recently ‘invented, constructed and formally instituted’, or had ‘emerged in a less easily traceable manner’” (Pukui and Elbert 1986:235). Here the suggestion is that Polynesians were adopting cultural constructs developed by foreign scholars during the late 1800s and the 1900s. A continuous see-sawing between beliefs seems to operate over the long term. However, against this is the obvious fact of original migration and settlement, so it is more likely a comment about the adoption of ‘pidgin navigation’, a composite of European and Polynesian techniques.

Much of Finney’s motivation came from the 1965 construction of a 40-foot replica of a Hawaiian ‘double-placed canoe’ in order to test Andrew Sharps’ claims, in *Ancient Voyages of the Pacific*, that Polynesians could not have intentionally sailed to islands more than 500 kilometres distant. In 1973 Finney founded the Polynesian Voyaging Society and built a 62-foot replica fibre-glass canoe, the *Hokule'a*. In 1976, the *Hokule'a* was sailed to Tahiti. “Sailing back and forth across the more than 2000 miles of blue water separating Hawaii and Tahiti would constitute a crucial test of Sharp’s claims” (Finney 2002:9).

Finney sailed the *Hokule'a* from Hawaii to Aotearoa (New Zealand) and returned, stopping at the Tuamotus, Tahiti, the Cook Islands, Tonga and Samoa. This voyage of rediscovery, a 12,000-mile odyssey, took from 1985 to 1987 to complete and opened Hawaiian horizons to the rest of Polynesia and “inspired their cousins

from the South Pacific to think about building and sailing their own canoes” (Finney 2002:12).

Anderson, Chappell, Gagan and Grove have claimed that the *Hokule'a* was not a replica craft but a composite, combining elements from diverse Polynesian boating methods from the early European era. Furthermore they claim that linguistic reconstruction indicates that terms for double canoes developed only after the settlement of West Polynesia (3000 cal. BP) and remote oceanic migrations were probably made by outrigger or raft (Anderson et al. 2006:2).

### **How the Polynesians navigated in the Pacific**

When David Lewis asks, “How has the indigenous concept existed?”, and responds “[T]his is a question that has implications for the whole field of prehistoric navigation,” (Lewis 1994 [1972]:109), he makes an assumption that Polynesian navigation was pre-historic, whereas it occurred in parallel with early attempts in European navigation. It was not in the sense of before-time or prehistory, so much as independent of European time, during which time was thought of in a different ontology. Polynesian navigation was based on environmental immersion and a less representational series of axioms than was European navigation. Labelling navigational knowledge ‘prehistoric’ consigns it to a past that is outside rather than contemporaneous with European time, and it delineates a field of enquiry that is in European terms. It creates an impression of a potent present that is governed by the hegemony of European historical discourse rather than experiential engagement in the phenomenological world. Time transcends both persons and environment, yet each must pass through it. Polynesian ideas of time were based on the natural calendar rather than the European clock.

Furthermore, as Lewis suggests that “...magnetic and sidereal systems of orientation are so nearly incompatible, and...charts and compasses are far easier to master than sea lore, requiring half a lifetime of laborious study” (Lewis 1994 [1972]:110), he thereby contradicts the ‘laziness’ described in Best’s discourse regarding Polynesian navigation in comparison with European culture. Lewis doesn’t question the validity or efficacy of Polynesian navigational lore but suggests that the European system is easier to learn. Perhaps by ‘laziness’ Best actually signals that the European wasn’t engaged with the phenomenological complexities of the Polynesian world, and anticipates instead the Polynesian’s learning European culture. Whilst a different set of mentalistic assumptions are made in both systems, differing underlying beliefs do not seem to influence their efficacy. The European may believe the Polynesian’s technique works, and in fact Cook was shown that it does through Tupaia’s navigation of *Endeavour* around the Tahitian Islands. Later, Mau Piailug’s navigation with Finney and Lewis in the *Hokule’a* from Hawaii to Tahiti showed the same thing.

The Polynesian version was overlooked by Europeans, despite being adapted a priori from nature and requiring no representational interpretation. European techniques could be in theory adapted to any ocean anywhere on the globe, whereas Polynesian techniques were intimately tied to knowledge of the Pacific.

The two ontologies are so different that indigenous sailing techniques were unlikely to have been influenced by European concepts. Polynesian sailing required such a complex understanding of the phenomenological world—etak islands, the sidereal compass, swell orientation, wave refraction patterns, deep phosphorescence, land loom, cloud lore, homing birds such as the annual migration of the land-based

long-tailed cuckoo, sea marks, and stars, that it was largely outside the European system.

The indigenous methodology involved a meeting of two worlds, ocean and sky. Most accounts of Polynesian methodologies are based on zenith stars. The star's declination gives the celestial latitude. As the star progresses from east to west it passes directly above all those places whose latitude equals its declination, including of course the island destination. Thus, for example, if Sirius traverses the zenith of Vanua Levu, "a navigator, noting that this star was directly overhead, could deduce that he was in the same latitude as the island" (Lewis 1994 [1972]:278). Star compasses, in which known positions of stars were recorded, were also used. In many ways they were more useful than the points on the European magnetic compass. A vessel would depart on a bearing in the direction required. The navigator would steer by stars low in the sky that had either just risen or were about to set. These 'horizon stars' were orientated above the intended landfall. The navigator would steer towards whatever star rose or set in the direction of the island. The steered direction was known as the azimuth or bearing of the guiding star, which in the Pacific rises in the east and sets in the west. Stars are known to rise four minutes earlier each night (Lewis 1994 [1972]:82).

The horizon star was used only for a certain period. When it became too high or was at the side of the intended destination, the next star to rise or set at the point of landfall was used. The course maintained allowed for the successive displacement of the original star or 'aveia'. How high the star could rise and still be used for steering and how many successive stars were used depended on the direction, course and latitude of the vessel. It was rare that more than ten were used per night's sailing of

twelve hours. Positioning was also made by the rising and setting of the sun's shadow on the canoe's mast at midday

In daytime steering the four compass points were indicated by the sun—easterly and westerly, sunrise and sunset (due east and due west only at equinoxes), and, with periodic comparison with the stars, north and south, precisely determined at noon. Apparently, however, it wasn't just stars and sun that navigators steered by. As mentioned in Best, Captain Ward writes, "I have heard from several sources that the most sensitive balance was a man's testicles, and that at night or when the horizon was obscured, or inside the cabin, this was the method used to find the focus of the swells off an island" (Best 1923:127).

Keeping course by the wind was the most accurate method of secondary orientation. It was a simple and useful method. This was a modified version of every helmsman's task—to be aware of the direction of the wind in relation to the vessel. A change in the wind would mean a change in course, but Polynesian techniques made use of a wind compass, with known vectors of wind displacement relative to island positions.

A third reference was the Polynesian etak system. It mentally cuts a voyage into stages or segments by star bearings of a reference or etak island. The navigator's position at sea is defined in etak terms. It provides a framework "into which the navigator's knowledge of rate, time, geography and astronomy can be integrated to provide a conveniently expressed and comprehended statement of distance travelled" (Gladwin 1970:127) and is a technique of visualising where the navigator is. As the voyage progressed from island A to island B, the bearing of a third island C would alter until C came to lie under a known star system Y, a point on the sidereal compass between star X and Z. Thus the etak island had moved from one star point to the next

(Lewis 1994 [1972]:109). An etak system of tacking upwind towards an island in zigzag fashion against a known horizon line of star positions was also used (Fig 2).

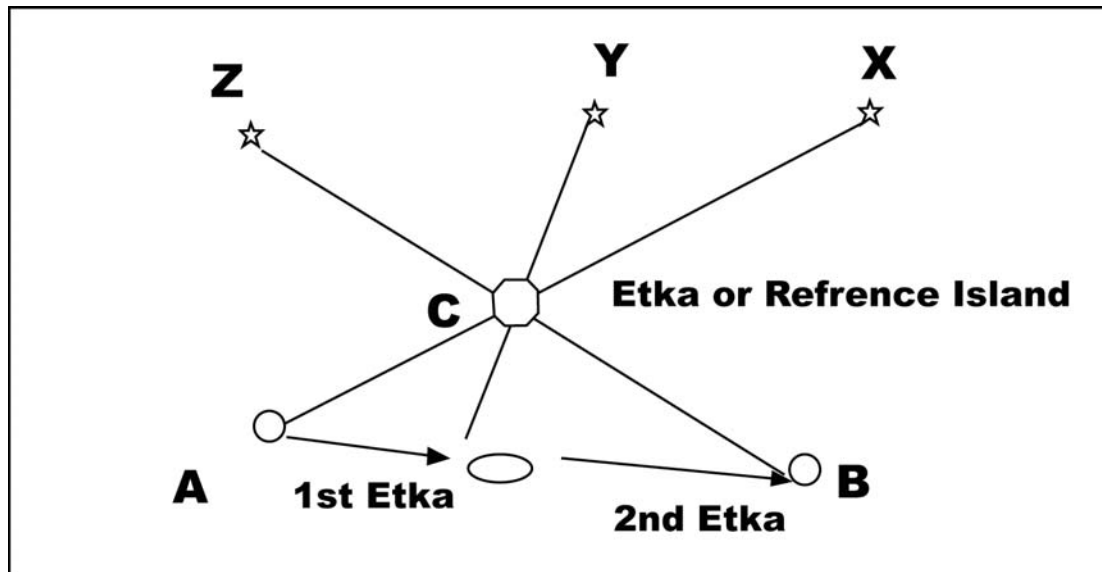


Fig. 2: A short voyage of two Etka from island A to island B (after Lewis 1994 [1972]:174).

Furthermore, Polynesian navigation systems made use of leeway. Leeway was estimated by sighting back along the centre line of the canoe and observing the angle between the wake and this projection of the course being steered. The sideways drift under sail, and gale drift, needed to be allowed for, along with the canoe speed. Using these changeable orientation reference points, navigators could visualise their positions, which also made it easier when tacking to windward out of sight of land.

The determination of the position of a vessel from the record of the course steered, the distance made, and the known or estimated drift because of the forces of sea and wind is a process known as dead reckoning. Polynesian navigators had a method for working out the mean speed and the distance covered in a day. One method of estimating speed was by counting the seconds it took a vessel to pass a patch of foam or bubbles. Three fifths of a boat's length in feet, divided by the time in seconds, gives the approximate speed in knots. If, for example, a 30-foot canoe passes an object in three seconds, the speed will be  $\frac{3}{5} \times \frac{30}{3} = 6$  knots (Lewis 1994

[1972]:159). Astronavigation, the study of heavenly bodies in motion, produced a degree of accuracy on a human scale, whereas measurements of latitude and longitude represented position in mathematical form (Lewis 1994 [1972]:161).

Polynesian navigational ontology involved different orientations with regard to place than did the European. There were two main systems involved: the 'home centre' reference system in which the voyager would retain constant anxiety about his home and would often look back to see where he was in relation to his point of departure; and the 'self-centre' system, in which the person himself was considered to be the centre. It is thought that explorers used the self-centre system (Lewis 1994 [1972]:159).

Contemporary Polynesian navigation combines elements of both systems. The self-centre system uses external references like star positions on a north pointing compass needle, or it may not involve a magnetic compass needle but use a sidereal or star compass. In older Polynesian navigation the self-centre system was combined with the home centre reference system (for example, sidereal and etak) and could be better considered as a self-sky-ocean relating system.

There were also land-finding methods that served to expand the target, such as wave interference phenomena and swells distorted by land, including the deep phosphorescence of undersea algae, which accumulates around land. The flight patterns of certain homing bird species are generally understood to be useful up to twice the sight range away from an island from a canoe, or about 20-25 miles [32-40 kilometres] (Lewis 1994 [1972]:205). Islands may block sea swells as the swells refract around them. Eyebrow and V-shaped clouds indicate land. Other methods for 'expanding targets' included the use of the sun's rays; observing drifting objects and deep reefs; considering weather lore and sea marks; and the sightings of certain fish.

There are also accounts of ‘wind gourds’ used by Hawaiian and Cook Islanders to invoke desirable winds, and of the more practical Tahitian wind compass, which divided the horizon into up to 16 bearings each dominated by distinctive winds blowing from various points. Many Polynesian methods of navigation are not known to European science. The exceptions are stick charts (constructions of palm ribs bound by coconut fibre that demonstrate the dynamics of different kinds of waves in relation to the location of atolls, such as the Mattang, Medo, and Rebbilib types of chart (Lewis 1994 [1972]:245, 246, 249). Stick charts and the sidereal compass remain the most authentic physical exemplars of Polynesian navigational practices, delineating positions of islands and swell patterns using shells as instructional and mnemonic referents, and using etchings of wind directions relative to a known island position. They have received European corroboration by the retracing of voyages with surviving Polynesian navigators. By using techniques derived from extensive interview and ethnographic evidence oral histories have been transcribed, and there has been computer modelling of Polynesian navigational techniques.

Giovanni Bennardo studied map drawing in Tonga to investigate features of the mental representations of spatial relationships for Tongans. He showed there are three forms of frame of reference or perspective taking involved. They are a relative frame of reference that is centred on a speaker; an intrinsic frame of reference centred on an object; and an absolute frame of reference that uses fixed points of reference (Bennardo 2002:392). Bennardo’s study investigated cultural differences in the preference for spatial relationships and shows that some speaking communities show mental and linguistic preferences for certain frames of reference, describing spatial relationships linguistically and in mentalistic representations of them. Tongans used the single-axis subtype of the absolute frame of reference more often and prior to any

use of the cardinal-points subtype of the absolute frame of reference. These fixed points and relative axes (one or two) are later used to locate objects in the environment. They demonstrate the Polynesian affinity with both the etak island reference system and navigating by steering by guide stars, and give a plausible reason for Polynesians' continued resistance to the European compass, with its cardinal and fixed reference points.

From another viewpoint Polynesian and European navigational traditions were largely separate. Polynesian tradition was influenced by Europeans only as far as they penetrated Polynesian culture, Polynesian canoes and outriggers used different navigational methods from European vessels, and in shape and form they were derived from different maritime traditions. Just as a European vessel could not respond in the seas as a Polynesian vessel could in terms of speed or manoeuvrability, so the Polynesian had no need for the abstract systems of the European. Polynesian notions of subjectivity differed from the European reliance on a fixed and centralised viewpoint, be this a compass reference, or proximity to timekeeping devices. The two traditions did not respond to the environment in the same way, with a different sense of inhabitancy.

As the weight of numbers of Europeans gradually brought about cessation of the use of Polynesian navigational techniques, Polynesian craft began to be replaced by European, so that Collocott, writing in 1922 of the Tongan star compass would remonstrate, "Few if any living Tongans are able to point to and name more than a very small proportion of the stars, and only in rare instances have I been able to identify the stars named." (Collocott cited in Lewis 1994 [1972]:116)

## **A European history of Polynesian navigation accounts from early encounters**

According to Elsdon Best, there were three phases of Polynesian navigation. The first stage of voyages consisted of near-ocean coastwise expeditions from islands in which the coastline was the guide that mariners could not lose sight of. The second stage involved the passage across extensive stretches of ocean from island to island to point, by navigators conversant with land contours, who noted the regularity of certain winds. The third stage involved separation from land guides and journeys of more than 500 kilometres east to west across the Pacific (Best 1923:48).

While Best's account notes these progressive stages of voyaging around land, and engagement with ocean patterns, he does not provide an account of the other phenomena already described, which the Polynesian navigator reflected on while steering the outrigger to island destinations across the Pacific.

European ethnographic views of Polynesian knowledge demonstrate the limitations of partial exchanges, lack of comprehension, doubts as to the validity of accounts of Polynesian long-distance voyaging, and a sense of eclipse, as one set of knowledge referents slides across another. In European documents there are different examples and accounts of Polynesian navigation practices. Various political positions are assumed by Europeans regarding Polynesian navigational knowledge and practices, and there are various accounts of different stages of adaptation to Western techniques.

The remoteness and internalised referents of the European long-range navigation techniques were foreign to Polynesian tribal society, whose members navigated by complex phenomenological and spatial representation. As Holbrook's research on Moce Island in 2002 shows, Polynesian navigators are reluctant to use the

magnetic compass even in contemporary times (Holbrook 2002:22). The adoption of the compass and of the European method of measuring time would entail the collapse of two different ontologies. A sense of time in the Polynesian present would be surrendered to a sense of European time, and with it the narratives of ancestral lore that infused Polynesian techniques. As the magnetic compass is employed, the sky collapses, falls in, and the seascape is compressed under the cartographic paradigm and its reliance on optics, mathematics and linear perspective. The changing, shifting phenomenology of ocean, sand, wind, sky and stars—the physical referents of a cosmic system—are surrendered to map, magnetism and clock.

Successive waves of migration and colonisation brought humans to Polynesia. According to Irwin, the first Polynesian voyagers sailed between the islands of south-east Asia, Sahul (greater Australia/New Guinea) and western Melanesia between 50,000 and 26,000 years ago. The migration routes coursed along two corridors of adjacent islands from the north of Australia. The northern route runs between Sulawesi and the north-western tip of New Guinea, and the southern route between Flores, Timor and the south-western coast of New Guinea. The second wave of Pacific voyaging took place 3500 years ago and ranged much further across the ocean. According to Irwin, the corridor of islands created a ‘voyaging nursery’ for colonisation and expansion. Although prevailing winds in the Pacific run from east to west, archaeological and ethnographic evidence suggests that the eastern islands are most recently settled. The accepted theory is that sailing against the wind made returning home easier. Were these migrations a two-way movement; were they deliberate or were they ‘nautical accidents’?

There is also speculation that Chinese were voyaging in the Pacific before the common era, with the Chinese Han Emperor Wu (141-87 BCE) dispatching trading

expeditions to the archipelagos of the south. Between the third and fifth centuries CE the sea route via Java was widely used for travel between China and India. In the fifteenth century CE, under the Ming dynasty, the Chinese navy mounted a series of large expeditions through the South China Sea. However, records of voyages were destroyed, and in 1426 an Imperial edict forbade the building of large ships. As a result, by 1550 the old shipbuilding skills had been lost. The succeeding Qing dynasty took anti-mercantile policy to its logical extreme, burying villages and clearing the population from a strip of coast 50 kilometres wide and 1100 kilometres long to create a zone between land and sea. Why? What cultural encounters would the records have shown? The likely causes are xenophobia, or fear of invasion or of cultural contamination. Furthermore, both Salmond and Holbrook speculate that there may have been some Chinese contact with northern Australia prior to voyages of Tasman. Whether or not Chinese landed on the northern coast of Australia, it was certainly part of the Chinese sphere of trade by the 17th century.

Many details in Best's account we now know to be incorrect. Whether this is because he had incorrect information, or there was inconsistent interpretation of Maori ethnographies, orations, and European accounts, it is difficult to know. Certainly some inductive inferences made from Best's sources seem to be erroneous or inconclusive. For example, Best's claim that: "Maori tradition tells us that their ancestors, in times long passed away, migrated from a hot country named Irihia (cf. Vrihia, an ancient name for India), and crossed the ocean in an easterly direction" (Best 1923:4) is incorrect. The direction of travel indicated is not wrong but the country of origin is. Almost any modern account except that of Thor Heyerdahl concludes that Polynesian origins were in south-east Asia. This has been confirmed by tracing the DNA ancestry of different Polynesian and Asian peoples.

Best further states: "I hold that study of Polynesian philology, religion, technology, sociology, general customs, and physical characteristics, as also the origin of most of their cultivated food plants, calls emphatically for a western origin of the Maori, and is decidedly against the assumption that he came originally from an eastern fatherland." While the evidence overwhelmingly points to Polynesian origins in south-east Asia and eastern Indonesia, Best did not have access to the literature of mtDNA evidence (Richards, et al. 1998). It is possible that Best had an agenda to accord with European settler sentiment in the Pacific at this time, that he voiced this belief in a self-referential attempt to appease relations with the Polynesian cultures that he spent time among, or he was indoctrinated with the nineteenth century romantic view of the oriental exotic. Best was simply wrong about Maori and Polynesian origins.

Furthermore Best claims that the cause of the Polynesian exodus from the homeland, "...which is said to have been a great country, was a disastrous war with a dark-skinned folk, in which great numbers were slain" (Best 1923:4). However, the notion of Polynesian origins in the Pacific in conflict with another ethnic group runs counter to the narratives of Maori and Polynesian creation myths. It is likely that Best's views establish a precedent for European exodus and conquest. "Mr. Percy Smith, who has written much on the origin of the Maori, tells us that ancestors of the Polynesians probably entered Indonesia about the commencement of the Christian era, and reached central Polynesia about the fifth century A.D." (Best 1923:5).

Best and Smith are inconsistent about the achievements of Polynesian navigation. They exist in their narrative in various states of proof and disproof. The narrative comprises a mixture of European written and oral accounts, interpretation of Polynesian legend and, I suspect, simple conjecture. Best waxes lyrical at Polynesian

achievement in comparison with European, but largely within the context of a ‘pre-historic’ past. Polynesian achievements are relegated to antiquity, at a parallel with European interest in neoclassical cultures, but from which state they did not progress, or from which they even regressed, as they did not experience modernity. Polynesian society in Best’s early twentieth-century present is shown as reluctant to embrace modernity. This ascription of a gulf of knowledge lost from Polynesian antiquity probably reflects an attempt to backdate the 150 years of cultural displacement in the Pacific at the time of Best’s writing. In sympathy with eighteenth-century European Antipodean Romantic artists such as Webber and Hodges, Best paints Polynesian navigators in neoclassical terms: “The Polynesian was the champion explorer of unknown seas of Neolithic times...we cannot but acknowledge that, as bold navigators, the Polynesians were far before any nation of antiquity in this art” (Best 1923:5).

Thus, Polynesian culture was compared favourably with Asiatic and culture in the BCE and even with Columbus in the fifteenth century. Best acknowledges that Polynesian ocean-voyaging achievements were great but took place in the reified world prior to modernity. The implications are that European modernity has surpassed Polynesian culture with a vastly different set of technological and cultural assumptions. The difficulty of retrieving Polynesian narratives shows in Best’s discourse the way in which Polynesian culture is subsumed within Western power relations: “Very little has been preserved of these remote times and movements, as must be expected among a scriptless people” (Best 1923:8). This statement tends to mute intercultural courtesies. Nineteenth-century missionaries equated the apparent vagaries of their Polynesian star navigation with the provision of the Christian God.

That is because they themselves had no better way to explain it. The Christian church depends on physical culture to motivate the call for enlightenment.

Further examples of historical verification from Best (1923:19) include a paraphrased account of a cross-cultural navigational encounter by William Mariner. Mariner was an Englishman who lived in the largely pre-Christian Tonga Islands from 29 November 1806 to (probably) 8 November 1810. Returning to Vavau in an outrigger with natives from another isle of the group, a dense fog enshrouded the canoe, the wind changed and so too did the direction of the vessel from the island. Mariner, who possessed a pocket compass, detected the change in direction but could not convince the natives that their outrigger was heading away from Vavau out into the ocean. A clouded sky was the greatest obstacle to Polynesian navigation but the Tongan crew believed Mariner's compass to be inspired by God, a supernatural object in itself, and so were reluctant to change course.

Furthermore, Best (1923:26) cites the Viceroy at Lima, commenting on Pedro Fernandez de Quiros, pilot of Mendana's expedition in 1595, as claiming that it was not difficult to find a large island at a near distance, but as expressing incredulity that landfall on a small distant island could be gained by Polynesians "without science". In Best's narrative there is a consistent under-estimation of the navigational skills of Polynesians and at the same time an inaccurate glorification of Polynesian pre-history. Again, it is indicative of the process in intercultural exchange in which one sees the culture of the other in terms of one's own cultural assumptions.

That Victorian anthropology could be hypocritical and inverted is shown by Best's paraphrase of Fenton's account, claiming that the Polynesian race "were in no hurry...leisurely sauntering across the Pacific...on the other hand, there was evidently a period in the history of the race when it showed a spirit of energetic daring, and love

of discovery and adventure, that has scarcely been equalled by any other neolithic people; when long voyages were made by old Polynesian Vikings in their primitive vessels that eclipse any voyaging done by our own ancestors prior to the adoption of the compass.” (Best 1923:30). Polynesian craft were swifter in the Pacific prior to the introduction of the outboard motor. Like Best, Fenton elides European neoclassical sentiment with the belief in a Polynesian ‘golden age’ at the time of the Pacific migrations.

Fenton’s recant is double-coded. It consigns Polynesian achievement to the neoclassical past, and again shows inconsistency. Why should Polynesians “show daring” in one era and “saunter” in another? Fenton is merely mirroring his own apprehension of European culture. The successional views of European culture in the Pacific were read onto Polynesian culture, with little real engagement with Polynesian differences. There is consistent misreading of the rhythm of Polynesian life compared with the relative chaos of Europe and its systems of linear planning. Polynesian culture is consigned to the glory of the past, ignoring the complex social structures of Polynesian villages and ecologies simply because it is safe to do so. It is as if time has reversed for the two groups. Experience of the Polynesian ‘golden era’ is Europeanised, while Polynesian culture in the present is made out to be fragmented and in decline.

A comment from the Reverend J E Newell in Best, about Polynesian skill in navigation and knowledge at sea being more extensive and accurate than in the nineteenth century, is curious, as it suggests that Polynesian culture is in decline and confuses narratives of settlement with those of post-settlement contact. Newell’s discourse is redolent of European ascendancy, as if Europeans are retracing Polynesian steps in the present. Perhaps this is a projection of a European South Sea

future. By coming to the Pacific and entering into contact with Polynesians they could participate in the glory of the Polynesian past, whilst occluding the benefits of modernity. Furthermore, by eliding a common era in a past of glory, it subsumes both cultures into the Judaic-Christian continuum, and provides justification for European intervention in the present. European modernity and linear navigational techniques subjugate and render child-like Polynesian culture, and it admonishes Polynesians for having 'lost' knowledge.

What can be assumed from the supposed decline in traditional navigational techniques? That Polynesians had reached their destination in sufficient numbers, that they regarded inhabitancy of Aotearoa as fulfilment of ancestral mythology. Tribal arrangements after migration precluded the need for large-scale journeying. Navigational skills were retained sufficient for the extensive fishing grounds and to re-join with the spirit of the ancestors in Hawaiki after leaving this world.

While Smith may be correct that voyages of migration in the "golden age of navigation and seamanship" ceased four or five hundred years ago and subsequent voyaging was largely of the inter-island variety, his comment that Polynesians were "pretty well over the eastern Pacific" during the original period is misleading. Were they not "all over the Pacific" in the present, it provides justification for there to be fewer in the present day, by blaming them for "losing civilisation" when in fact they are just different.

Accounts within Best are varied and contradictory, inconsistent about the extent of Polynesian sea-faring practice. So if not science, then it was a humanistic art, requiring a different ontology. More in tune with the phenomenological world, it had to take into account more clues from the physical world and make computations of distance travelled using various changing markers (that were fixed in the European

system). For Europeans, time is abstracted and representational. It is not part of the inhabitancy of the natural world but set apart from it.

Remarks made by Labillardiere, the historian of the D'Entrecasteaux Expedition (1793), show how Polynesian voyagers puzzled and astonished early European navigators. Soon after the arrival of that expedition at Tongatapu, the Fijian chief arrived on the island after a three-day voyage of 150 leagues (450 nautical miles). Labillardiere remarks: "This is an immense voyage for people, who having no instruments, steer only by observing the sun and stars with the naked eye, as soon as they are out of sight of land; but it is still more difficult to conceive how they can reach Tonga-tapu from such a distance, when they have to work up against the south-east winds, and they must be sure of their marks in the heavens, not to miss land, after being obliged to ply to windward, as they are sometimes, for more than a month" (Best 1923:38).

Missionary John Williams remarks how certain landmarks were steered by until stars became visible. One such was Atiu Island as a way marker to Rarotonga, which was confirmed by compass check. In the early nineteenth century the Polynesian compass was not magnetic but celestial, linear and three-dimensional. Part of the European astonishment was that despite having abstract knowledge the Europeans had neither the local and practical knowledge of the Polynesian, nor the immersion in the phenomenological world that the Polynesian enjoyed. Charts and compasses had given the Europeans not only long-distance navigation but also a sense of remove and remoteness from their environment.

Often European accusations of ignorance mirrored their own state. An example is provided in Salmond, of Jacob Roggeveen, the Dutch explorer who discovered Easter Island by chance when he was blown off the coast of South

America. Roggeveen then claimed that the idea that Polynesians had settled the Easter Islands purposefully “would resemble mockery rather than serious thought” (Best 1923:8).

However, Louis de Bougainville, French navigator and military commander, expressed more sympathy with the Polynesian position and had some insight into their navigational techniques when he claimed: “[T]he better instructed people of this nation have a name for every remarkable constellation; they know their diurnal motion, and direct course at sea by them, from isle to isle. In these navigations, which sometimes extend to three hundred leagues, they lose all sight of land. Their compass is the sun’s course in day-time, and the position of the stars during the nights” (Dunmore 2003:268).

Bougainville’s account is insightful. What it does suggest is that those not in possession of a reliable chronometer by which to determine longitude, were more at the mercy of vagaries in position finding if the abstract co-ordinates of linear perspective, mathematics and optics would not cohere in a particular sequence of charitable co-ordinates than were the Polynesian navigators with their ever-changing and complex phenomenological vocabulary.

### **“Earth and sky almost meet”: Polynesian literary views of recovered knowledge**

Philip Armstrong writes in his critique of the anthology of Polynesian poetry, *Whetu Moana*, that “...‘Star’ is what provides the ‘waka’ with its point of reference, guiding light, orientation, direction, wairua– as in traditional Polynesian navigational practice. That guidance system is embodied in both people and things, and serves the culture and its members” (Armstrong 2003:36). This romantic image, which Armstrong has enhanced from Sullivan’s poem, captures the link between ancestral

narrative and contemporary relevance but it is also a reminder of how difficult it is in the context of Polynesian poetry to fuse the two traditions of Polynesian phenomenology and European scientific engagement, which characterise the bifurcated narratives of Pacific navigation.

Whilst one may agree that the poems of *Whetu Moana* embody a style of ‘voyager citizenship’ specific to Oceania, and although one might remonstrate against the loss of cultural complexity that this once entailed, it is more difficult to agree that there are no poems of ‘literary self’, no ‘rhapsodies to the deep self’, for this is precisely what many of the poems seem to both question, offer, and remonstrate for (Armstrong 2003:25).

Whilst it is not the intention here to focus on this contradictory reading other than to elucidate its relationship to the themes of Pacific navigation, it could be suggested that what Armstrong regards as the ‘psychoanalytic’ self, as something separate from the sense of identity he discerns in his reading of these poets, is problematic. Firstly, it tends to privilege the deep self as a realm beyond the reach of these poets, when precisely what they are doing is attempting to exercise and give expression to that self. Secondly, it denies them the agency and possibility for redemption contested by the coloniser in the process of occlusion. It makes them discoverers of a European Pacific, rather than original discoverers, arrivants and settlers who navigated the Pacific islands in the Holocene period through their own skill.

That the psychoanalytic voice should by implication be one of unannounced vitality and separate from Polynesian culture is disingenuous. The psychoanalytic voice may be described firstly by ‘being’ and secondly by annunciation, and a variant may be the voice of lament and remonstrance. If we return to the original intention of

the anthology as expressed by the editors in the introduction, through the concept of sea, sky and stars, anthologists were aware of how Polynesian people learned how to ‘read and work’ with their world, “...they learned about reading the ocean currents, wind and stars in which to sail and navigate their lives by” (Wendt, et al. 2003:1). Thus the anthologists acknowledge that the islander’s ontology is one in which presence in the environment and a state of calm acceptance form the basis of the inhabiting self. Navigation was a state of being.

The occlusion of this may be explored in Brandy McDougall’s poem ‘The salt-wind of Waihe’e’ in which she acknowledges the call of ancestry in the remembered presence of communal rebuilding, in front of which an ocean ‘howled’ and the sun sinks. True kinship here is something repressed and unseen:

[I]n the ocean’s howl, in the light of sun sinking

beneath the waves. Your daughters watched  
through a window, glass hazed by salt. We stood  
out of the Waihe’e wind and felt nothing

near love, the erosion for a windy sea  
that kept you, offering only driftwood  
in return (McDougall 2003, 122-123).

Roma Potiki’s (Te Rarawa, Te Aupouri and Ngai Rangitihi) ‘When it’s summer’ seems to offer the clearest contradiction of Armstrong’s denial of ‘deep self’ to the Polynesian present. It is a self to be negotiated through interaction with the local environment, immediate and phenomenological:

when it’s summer  
and earth and sky almost meet . . .

as I stand and run down to the sea, to the water.  
feel its kick and rhythm  
its fish music.

buoyant and strong I am carried back  
to the lip of firm sand (Potiki 2003, 158-159).

Here self and environment are co-existent and co-creative, the 'I am' is neither sublimated nor subordinate, but invigorated and empowered by the ocean and beach. Apirana Taylor (Ngati Porou, Te Whanau a Apanui, Nga Puhi, Ngati Ruanui, Ngati Pakeha), appears to engender a sense of self which is closely anthropomorphised with the environment. Yet does he? As demonstrated from the discussion of Pacific navigation we might take Taylor as expressing literal values when he claims:

I like that  
because in my world  
the wind talks  
the river talks  
the tribes of rocks and stones talk  
because they are people  
and the stars sing karakia (Taylor 2003:213).

In his poem, "Waka 57 El Nino Waka" Robert Sullivan suggests traditional island co-existence took place in a community of imagined balance and harmony, prior to the environmental disturbances of modernity. Navigation required no external instruments other than those provided by the environment, which could be read as it was inhabited and traversed.

Among the compasses of navigators –  
star compass, wind compass, solar compass –  
a compass based on currents, such was  
the reliability of the sea. Today the sea  
is unreliable (Sullivan 1999, 64).

Yet modernity has altered the environment. Global warming, the emissions from motorised transport, greenhouse gases, have led to an undermining of resources, to a 'sick' world in the Pacific:

[A]round the rim of the Pacific, the great fluid  
of the compass a-bubble with this burst artery.  
I can see its origins, as you can (Sullivan 1999, 64).

Sullivan suggests a bias operating between the natural world and the human experience of it caused by environmental degradation and the reductivity of modernist science.

The planet, as you are aware,  
is not only our mother, but the mother of all  
living creatures here, from the latest computer virus  
to the greatest of the primates. She carries us  
through the universe. These things  
are simple, something that human beings  
have known throughout their human beingness,  
which we know is brief compared to our mother's being.

El Nino is blood from our mother. She bleeds  
internally, then from the ocean into the air in a maelstrom (Sullivan 1999,  
64).

In Sullivan's 'Waka 83' a sense of a 'whole self' emerges also, in the context of Polynesian ancestry and the aestheticisation of the phenomenological world of Polynesian navigation. This is the sense of self, which causes Philip Armstrong elsewhere to be so relaxed about the penetration of psychoanalytic culture into Polynesian consciousness. However, because the remembered object of the poem is consigned to memory I suggest that the psychoanalytic engagement of the Polynesian subject does emerge from this contextual oscillation. The poem enacts an interplay between the referential worlds of Oceania and the written text. There is a juxtaposition and correspondence of inhabitancy in the natural world, a direct relationship in the present which simultaneously agentifies and defies the political disengagement and the politics of post-colonial displacement through a sense of lived immediacy: emotion, beauty and belonging in the environment were once tactile but now are imagined.

Take me to Hawaiiki.  
Make an exception for one who breathes.

*I will take you while you sleep.  
You will see phosphorescent waves,  
do not be frightened . . .  
You will hear the elevated speech  
Of those who observe the destinies  
Driving the bodies of people,  
And all the stories buried there  
like sacristies. People will float  
like birds, fish will glitter, every cave  
and waterfall a musical instrument –  
a place too good to be true,  
a place the navigators were searching for,  
the home of their dreams,  
only in their dreams.*

And when I woke T was in the study typing (Sullivan 1999:93).

If there is no history of voyaging and arrival then Polynesian social narrative will lack cohesion; it also will separate the narrative of human belonging from dependency on any one particular region, especially those of childhood remembrance. In Polynesian culture, knowing the past and one's route through it to the present allows identity to be formed. The possibilities of journeying are more than vectors between points in time, or the transmissions of communicative mediums. They enable the agentic formation of stories of self. Polynesian navigation was effective over both near and long distances and required knowledge built over a long period of time, comprising narratives of agentic inhabitancy and complex knowledge of the Pacific habitus. The voyage represented a narrative journey also, allowing the development of psychological space. Whilst the Polynesian archipelagos did not bear the resources to invent compass or sextant, Polynesian navigation made use of natural marine phenomena and mentalistic spatial representations, and of narratives containing concepts, which required constant use to remain alive in the cultural memory.

### **Lost knowledge in cultural exchanges, the parallax view**

In Polynesian navigation following the European voyages of discovery one cultural system was introduced into another. The resulting intercultural communication and cross-cultural exchanges produced intercultural distortion in which each culture was in a different place from where it appeared to be to the other. European systems of long-range navigation gave licence for a kind of cultural relativism based on an object rather than a person-centred view of navigation. Prior to this the Polynesian had knowledge only of the Pacific archipelagos and the ancestral lore of long-range migrations.

It is unclear how Cook and Tupaia and successive European Captains and Polynesian navigators were able to communicate successfully and exchange knowledge of marine navigation. As Salmond points out, much was lost in the attempt at intercultural communication; encounters and exchanges were partial, and the two systems existed alongside each other, one with the advantages of written records and documented representational forms. In the European narratives of early encounters from the eighteenth century, there is little evidence that islanders studied European navigational instruments or learned the abstracted mathematical and geospatial calculations and methods by which Europeans charted the islands.

However, navigators did travel to European homelands to meet European figureheads and in so doing sought to bind them into their kinship groups as 'taio'. These systems of honour were not cross-culturally matched, as European society and Polynesian kinship groups were composed in very different ways. The large size of European populations as well as the reductive and instrumentalist approach of European science introduced an experiential remoteness that was foreign to the Polynesian.

Similarly Europeans could not record much of Polynesian navigational knowledge (such as star paths) because translation was difficult and the ancestral lore and spatial and phenomenological techniques required years of immersion in the Pacific. Polynesian navigational technologies were inherently tied to social and kinship relationships, which were both foreign to and displaced by regimes of European modernity.

The relationship between Polynesian navigation and ancestral lore is still relatively unknown and mention of it does not occur extensively in the literature of Polynesian voyaging (an exception is Finney, 1999). However, ancestral lore does have a symbolic, instructional and motivational role in Polynesian navigational practice. The following karakia is from *Sailing in the Wake of the Ancestors* (Finney 2003:182). It was recorded as being from Maori elder Te Ao Pehi Kara and concerned the revivalist voyages in the 1970s from Ra'iatea:

Tenei te nihinihi tenei te nana  
 Tenei te wa hikitia nga tapu  
 O runga I tenei kokoru ki runga  
 I o tatou matua Tupuna  
 E tangi ake nei te ngakau  
 Turuturu o whiti whakamau kia tina  
 Tina! Hui e, taiki e.

This is the neap tide and the raging tide  
 It is time to remove the tapu  
 From this bay onto our ancestors  
 The heart is moved  
 So let it be for all time  
 We are united (Finney 2003:182).

Concepts such as tapu and mana are not easily interculturated. From the Polynesian perspective the main difficulty with revivalist attempts is the loss of oral history. It is largely only European charts, sketches, journals, logs, revisionist writings and ethnographies that survive from the eighteenth century. Whilst these can be

examined, there were differences in the manner in which navigational methods and beliefs were communicated that precluded harmonious intercultural exchange. Access to Polynesian navigational knowledge from the European perspective was open-ended: ships' documents were easily seized or exchanged. From the Polynesian perspective, oral records, narratives and knowledge could take many years to learn but were relatively quickly occluded by the European culture.

### **Contemporary views**

In 2002, on Moce Island, part of the Lau Island Archipelago that borders eastern Fiji, Jarita Holbrook interviewed sailors and farmers aged from 54 to 84 on the mechanics of their navigation system; their knowledge of celestial bodies and wind patterns; and to obtain travel and sailing stories. The interviewees in Holbrook's ethnographic account all tended to confirm the loss of the celestial aspects of marine navigation as navigators became more dependent upon navigation equipment. This is confirmed by Feinberg (1995), Finney (1976; 1994), and Lewis (1994 [1972]).

Holbrook's ethnography reveals there was an uneasy fit between old and new navigation techniques. At the time of interview, navigation was still dependent on wind patterns, knowledge of islands and reefs, and star navigation through island markers—there was no use of the magnetic compass.

The Moce Island navigators claimed they had no formal navigation or naval training and did not describe their techniques in nautical terms. Knowledge of long-range voyaging techniques was not evident in their narratives and the Moce Island navigators appeared to use a new version of the traditional system, with inexact but sufficient homing skills. With the introduction of the motorboat, which was faster than sailing, there was a greater tendency to use knowledge of wind and currents;

however, visual clues were less useful on cloudy days or in storms. Knowledge of wind patterns was most important for older sailors.

Interestingly, Holbrook's interviews suggested there was a recent change to using star systems, which coincided with a desire not to lose traditional celestial aspects of navigation in the employment of new boating technologies. Outboard motors allowed vessels to travel in straight lines, with stars on the horizon as guiding beacons. There was more use of stars as reference points than of wind. Whilst the old method used the sun, moon, and Venus, as well as east-west markers, the new method re-instated the use of rising and setting stars. The Moce Islanders who Holbrook interviewed suggested they had invented the new system themselves over the previous fifteen years and claimed that the use of the outboard motor was compatible with star markers. Thus they retained elements of the old system combined with the use of outboard motors. Holbrook suggests that her study of Moce Island navigation serves as example of the "complex interaction between introduced technologies and navigation" (Holbrook 2002:216).

However, because of this hybrid modern and traditional system, long-range voyaging narratives are lost. There is a sense of the adoption of European time, of new methods, which combine traditional knowledge with new technologies but which dilute ancestral narrative and borrow from the linear Western perspective.

Holbrook's account is anticipated by ethnographic arguments from Best. In an account of an encounter with the double canoes of the Paumotu Group, Commander Wilkes writes in the mid-nineteenth century: "They have no difficulty in navigating them, and are now learning the use of the compass; but I am informed that they still prefer sailing by stars and sun, and seldom make any material error" (Best 1923:38).

## **Lost complexities**

The impact of modernity on traditional navigation in the Pacific is thus an account of lost complexities. European modernity had a tendency to reduce the journey as a means to an end, with the voyage between a time of departure and a time of arrival abstracted as a progression of representational co-ordinates plotted in space and time. However, for the Polynesian, the journey might be imagined as a continuous (dis)course through a natural system.

Without centuries of practical immersion in the Pacific environment it was easier for the European to regard Polynesian navigational knowledge as superstition, and their raw-crafted mnemonic devices and intricate method of oral recall as myth. Other difficulties too abounded: the cross-cultural exchange and translation of verbal, behavioural and customary knowledge was localised and sporadic. European colonisation of the Pacific economically overwhelmed the Polynesian populace in a relatively brief historical time, displacing traditional knowledge.

The body of Polynesian knowledge that pre-dated or coincided with Western knowledge was no less sophisticated than the European system, but made use of more contingent natural resources, and was more in harmony with the phenomenological complexity of nature than the reductive abstracted techniques of the European. Although the European model is based on science, because of their nimble vessels Polynesians could travel more accurately and more quickly among the Pacific Islands than could Europeans, prior to the use of the Harrison chronometer in the eighteenth century voyages of discovery.

The impact of modernity on the Pacific Islands and on traditional forms of cultural knowledge, including navigational techniques, with acculturation towards alienative and long-range distance techniques, led to conditions of unsustainability

and the erosion of what Clifford Geertz would call the 'thick' or complex relations of Pacific village life (Geertz 1983:52). The complexity and the experience of ecological balance in the natural and phenomenological world of the Pacific was thereby jeopardised through the introduction of European navigational techniques and the civilising gaze that sought to reduce its three-dimensional subjects to two dimensions. In the European system these could be surveyed from a centralised and internalised ship-bound viewpoint rather than the complex mobile, contingent, mentalistic and intrinsic frames of reference of the Polynesian spatial constructs of navigation.

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