PROFESSORIAL INAUGURAL ADDRESS:

Future Eaters in Australia, Future Eaters in the Pacific? Early Human Environmental Impacts

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Although not technically an Inaugural Address, such seeming no longer to exist at the Australian National University, this is what I would have given as one on taking up the Chair of Archaeology in the Faculty of Arts in January 1997 had I been called upon to do so. It was in fact the paper I presented as part of the selection process for the Chair on 25 th March 1996 in the Reading Room of the Humanities Research Centre at ANU. The only changes made to it have been the addition of full referencing to the statements made.

Australian Future Eaters?

Tim Flannery's 1994 book *The Future Eaters: an Ecological History of the Australasian Lands and People* got into the national best-seller lists and was recommended as Christmas reading by public figures such as then New South Wales Opposition leader, Bob Carr. Its view of Australia as a fragile and largely barren continent in need of tender nurturing but largely ruined by previous land use practices caught the public imagination. It created a nice 'conte morale', a moral tale to digest with the Christmas turkey. Exactly what the arresting title means however is never explained in any detail, except perhaps on the dust jacket, where it is said:

> "Since the first person left the great Afro-Asian homeland to cross the first island on the long chain to Australia, human beings have consumed the resources that they would need in future. The first Australasians were the world's first future eaters. Today, future eating is a universal occupation."

You will recognise the story, it is of course an antipodean version of the Fall with Aborigines as Adam and Eve.

Flannery identifies the human problem as being the break-out 40,000 or more years ago from an area where the species had long co-evolved with other animals (Afro-Asia) to a continent where the fauna was naive, it had never had to deal with humans (Australia). The megafauna of giant marsupials and other animals were soon wiped out by the new predators and with them went the delicate balance between fire and vegetation. The megafauna had previously ensured that fuel supplies were low in the bush by eating vegetation before it dried out and could burn. Their dung added precious nutrients to the naturally poor soil. Hunted to quick extinction by the newly-arrived humans - at one point Flannery suggests within a period of 100 to 500 years (1994:201) - their loss meant that fuel built up and massive bush fires soon spread and consumed the vegetation leading to rapid erosion of the thin topsoil. In response aborigines developed firestick farming to contain fuel levels and conserve the medium and small mammals upon whom they came to depend for their food.

A positive unintended consequence of the original disaster is mentioned in passing, however: "Fire saw the fat of the land slowly flushed onto the floodplains and into the estuaries, where today it supports swamp and mangrove. It is no accident that such areas supported the greatest density of Aboriginal occupation at the time of European settlement" (Flannery 1994: 233-4). A new equilibrium was thus painfully established, broken by the next wave of new settlers - most of us in this room. In large parts of the country the Aboriginal population went the way of the megafauna and the ecological balance was again upset, with the environmentally disastrous results we now live with and a second wave of faunal extinctions over the last 200 years.

Two aspects of this narrative are particularly interesting. The first is the almost total lack of hard evidence for this scenario in Australia as regards early Aboriginal impacts and the second is a feeling that one has read all this before in relation to somewhere else. The book goes on to reveal where. In a partial tour of the Pacific Islands, concentrating on two other very old continental remnants New Caledonia and New Zealand and trotting out another frequently heard 'conte morale', that of Easter Island, Flannery presents an exactly similar scenario. The Easter Island story, popularised by Bahn and Flenley in *Easter Island, Earth Island* (1992) is suggested by them as a microcosm of what we are doing to the world in very much in the same genre as *The Future Eaters*.

On the first point, the lack of hard evidence, I would point you all in the direction of Lesley Head's excellent piece in *Australian Archaeology* for December 1994, "Both ends of the candle? Discerning human impact on the vegetation" (Head 1994). There is at present no clear evidence of a massive burning phase early in the Aboriginal history of Australia, and for classic sites such as Lynch's Crater, Head reminds us that human-induced vegetation changes were interepreted as slow, the transition taking place between 38,000 and 26,000 years ago (Head 1994:84).

Any connection between megafauna and humans in either Australia or New Guinea is controversial. Cuddie Springs is the best case for Australia (Furby et al. 1993), and on the evidence presented so far I remain sceptical, while only at Nombe in the New Guinea Highlands is there any claimed association with humans in a site on that island (Mountain 1993). It is worth noting that there are now cave sites in the 30-40,000 BP range and perhaps beyond in Australia where fauna are preserved and no evidence of an association between humans and megafauna in any of them.

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There is evidence of Pleistocene burning in Australia and New Guinea which is most likely of human origin. The long-term effect of that burning on the flora and fauna is what is at issue.

Pacific Future Eaters

The Flannery model for Australia seems familiar because it is adopted from another narrative, that about the effect of humans on Pacific Island environments. Indeed it seems to work much better there, and there are more instructive case studies than the ones Flannery cites available from the most recent research. But a major difference needs to be stressed, one that Flannery overlooks. It is not the irruption of humans into naive lands that causes extinctions, greatly increased levels of burning in the environment, and hillslope erosion and subsequent deposition, but the irruption of humans with an agricultural technology and domestic animals in tow.

This can be shown by a contrast Flannery does not pick up on: the contrast between those parts of the Pacific settled in the Pleistocene by hunter-gatherers in Near Oceania (consisting of New Guinea, the Bismarck Archipelago and the main Solomons Chain) and the area often called Remote Oceania (consisting of the Eastern Outer Islands of the Solomons, Vanuatu, New Caledonia, Fiji and Polynesia and Micronesia) and settled only in the last 3000 years by agriculturalists.

New Guinea is a special case as it appears to be one of the areas of the world which was a significant centre of origin of agriculture. The human impact on the environments of the Highlands on Haberle's (1993a) evidence was cumulative. Intensification of dryland forest disturbance occurred between 14,500 and 12,000 BP, and increased again during the last 5000 years and particularly within the last 2000 years as a result of agricultural developments. When exactly the shift was made from what could be described, following Guddemi (1992), as 'hunter-horticulturalism' to full-on agriculture is a separate question.

The pattern of human environmental impacts is quite different however in the Bismarcks and Solomons, areas to which agriculture was introduced from outside just over 3000 years ago, although initial human settlement took place some 35,000 or more years ago and some forms of low-intensity cultivation were taking place probably from initial settlement. There are good faunal sequences from the Bismarcks and Solomons sites for the pre-agricultural period, although at present the pollen sequences are few and far-between.

The Manus, New Ireland, Buka and Guadalcanal faunal sequences show no species loss for the pre-3000 BP period. Indeed, on Manus and New Ireland there is evidence of deliberate introduction of marsupial species in the Pleistocene as part of a "game park" strategy to fill out the naturally depauperate faunal suite: the bandicoot *Echymipera kalubu* introduced presumably from the New Guinea mainland to Manus prior to 13,000 BP and the possum *Phalanger orientalis* introduced to New Ireland at about 20,000 BP. The northern pademelon *Thylogale browni* was also possibly introduced to New Ireland before 3000 years ago. There are bird remains in the sites but no evidence of any extinctions during this period.

The pollen evidence collected by Geoff Hope from Balof 2 on New Ireland of localised and short-term vegetation clearance in the early Holocene (from about 10,000 BP onwards) fits a pattern of small-scale cultivation or forest edge manipulation, and contrasts with the evidence from levels at the site post-dating 3000 years ago for much more terminal forest clearance (Allen, Gosden and White 1989:558). Similarly the pollen sequence from Lahakai Swamp near the south coast of Manus Island analysed by Wendy Southern (n.d.) showed that although there was evidence of burning in the catchment from before 6000 years ago, the major disturbance of vegetation occurred from 3000 BP onwards.

The evidence for the Bismarcks and Solomons then is not of a Future Eaters style human impact from earliest settlement at 35,000 BP or earlier but of a contrast between the period before and after 3000 BP: that is the period prior to the Lapita culture and the adoption of full-on agriculture, contrasted with the period during and after Lapita.

These periods are best contrasted by comparing human impacts from 3000 BP in this long-settled region with human impacts on the islands of Remote Oceania not settled prior to 3000 BP, islands that given the nature of their environments could probably not have supported hunter-gatherer groups. If you find sustained evidence for human occupation on such islands then it must represent an agricultural lifestyle.

Another signature of early agriculture on these islands is a 'pioneering' pattern of initial settlement followed by serious erosion in the local landscape, abandonment of an area for sometimes many hundreds of years and a later more conservation-oriented re-use with continuing occupation. This appears to reflect large-scale clearance for agriculture leading to significant environmental degradation. The response to this was to move to another area where presumably the process was repeated. In a more fully-occupied environment such a land use pattern was unsustainable, and so conservation practices such as terracing had to be developed to allow continued settlement.

This is the Future Eaters scenario, but it is a scenario about agriculturalists not about hunter-gatherers. Where we have both, we can see the relative effects of each lifestyle.

Major impacts on vegetation and direct evidence of increased rates of erosion are witnessed in the pollen records of various Pacific islands soon after initial evidence of agricultural groups, either Lapita or later. Within Island Melanesia the pollen record of a coastal swamp on Aneityum at the southern end of Vanuatu shows dramatic changes from forest to more open vegetation around 2900 years ago and suddenly high carbonised particle counts resulting from burning. Clay sediments washed into the swamp at the same time, giving direct evidence of the increased erosion rates one would expect to accompany such changes (Hope and Spriggs 1982). This is precisely the time when initial settlement might be expected on Aneityum. Since 1994 I have been working with Geoff Hope and Brad Pillans to collect more pollen and geomorphological evidence from Aneityum and other islands in central and southern Vanuatu to further examine the timing and effects of initial human settlement there.

A common pattern soon after settlement on the islands of Remote Oceania (in Polynesia as well as Island Melanesia) is the rapid extinction of many endemic species of birds and reptiles (Steadman 1989). This is linked to direct predation by humans in some

cases, but more clearly to habitat alteration for agriculture and/or competition with introduced species such as rats, dogs and chickens. Fossil evidence from New Caledonia and occurrences of bird bones only in the earliest settlement sites there suggest that about 40% of bird species became extinct upon human occupation of the island. In addition, a primitive crocodile, a horned turtle and a large lizard also became extinct (Balouet and Olson 1989).

The only bird bone recovered from my 1983 excavation of a 2300 year old site at Ifo on Erromango in Vanuatu was also of an extinct species, and so we can expect a similar pattern to emerge when that archipelago's fossil record becomes known. A site at Ponamla near the northern tip of Erromango was test excavated in 1994. Further excavation was carried out by Stuart Bedford and myself in 1995, and analysis is ongoing. The deep cultural deposits of this open settlement site contained up to three buried levels of stone terrace facings and cobble and flagstone-paved floors, associated with what may be a communal cooking area, representing the oldest substantial stone structures yet found in the Pacific Islands.

Ponamla has produced dates of around 2700-2500 BP. The archaeological material at Ponamla represents a short-term but intense occupation. Parts of the site are deeply buried by hillslope rubble, suggesting human-induced environmental instability, and the as yet incompletely analysed faunal remains include bird bones of a size suggestive of now-extinct species. Some had been made into bone needles. This area of Erromango is in a rain shadow and is today marginal for agriculture near the coast. It is tempting to view the site as an unsuccessful colonisation of the northern part of the island, abandoned after rapid environmental degradation and species extinction occurred following forest clearance. There is no evidence of later use of the site for at least a thousand years after abandonment.

Bird extinctions also occurred soon after human settlement on Tikopia in the Southeast Solomons, with bones of three of the five prehistorically extirpated species found only in the earliest Kiki Phase before 2000 BP. Excavated levels of this phase greatly exceeded those of later ones in the gross number of bird bones recovered and in number of species represented (Steadman, Pahlavan and Kirch 1990).

Moving back across the Near Oceania boundary, we do not see these kinds of impacts at earlier dates than Lapita despite a much longer human history. The Balof pollen evidence has already been alluded to: it suggests a fundamental subsistence change from about 3000 years ago when a probable regrowth plant of secondary forest vegetation becomes a significant feature of the pollen record (Allen, Gosden and White 1989). Several New Britain Lapita sites show direct evidence of erosion associated with or (as at Lolmo Cave in the Arawe Islands) occurring immediately prior to the first evidence of Lapita occupation around 3400 years ago.

These lines of evidence are interpreted as representing large-scale vegetation clearance for gardens. Three open Lapita sites in the Arawe Islands (Apalo, Makekur and Paligmete) produced clay deposits washed in from higher ground (Gosden and Webb 1994). At Paligmete the clay overlay Lapita pottery, and a sample two thirds of the way down gave an age of 2690 BP. Similar clay deposition was noted at the Lapita site of Apugi, near Kandrian to the east of the Arawes, and also at the earliest of the Watom Island Lapita sites at the eastern extremity of New Britain, overlaying the beach deposit underneath the site (Gosden et al. 1989).

It is known that bird and other species extinctions occurred in Near Oceania, but they are not yet fully reported. A number of species which were present pre-Lapita have not been found in any post-Lapita contexts These include several bird species including rails at New Ireland sites such as Panakiwuk, and on Buka further bird species and the endemic rats *Solomys spriggsarum* and *Melomys spechti*.

The agricultural system at the beginning of the Lapita period represented a pioneering tradition of forest clearance in a relatively empty landscape rather than a long-standing form of subsistence. Soil conservation techniques would only have come into play after evident stress on agricultural productivity was caused by growing populations or by techniques that were profligate in their use (and abuse) of land. The high rates of erosion apparently ceased about 1000 years ago in the Arawes, signalling the beginning of modern conservation techniques there.

The north Guadalcanal pollen sequences begin at about 3840 BP at Ruaniu and at 3470 BP at Laukutu. Burning of vegetation by humans was a feature of the environment from at least this time, but the earliest major impact of human activity on the vegetation through forest clearance occurred only some 2200 years ago with a dramatic increase in the pattern of burning and clearance of forest (Haberle 1993b).

This later impact is seen too in the layers of sediment washing into several of the Guadalcanal cave sites at this time, the result of increased erosion rates. A hiatus in occupation at Vatuluma Posovi occurs between about 2700 and 1300 BP. Breaks in the cultural sequence at Tavuro and Ngolu caves are defined by bands of charcoal-rich and slabby clays dating to about 2300-2200 BP (Roe 1993). These are interpreted as sediments washing in as a result of clearance of the hillsides immediately upslope. There is a contrast too in the fauna present in the pre- and post-clearance deposits at these caves. There is a reduction in forest taxa, including the virtual disappearance of rats of the genus *Uromys*. This goes along with a number of faunal introductions in the archaeological record such as pig, dog, the Polynesian rat, *Rattus exulans* and the possum, *Phalanger orientalis*.

We see on Guadalcanal the classic pioneering pattern of large-scale shifting agriculture, seemingly unsustainable in the short term and leading to abandonment of heavily impacted areas until later population growth required their reoccupation using a more conservation-oriented economy. On Aneityum and in New Caledonia the signal of this pioneering pattern is seen in the pollen record beginning about 3000 BP with initial Lapita-associated human settlement (Hope and Spriggs 1982; Stevenson and Dodson 1995). Equivalent early Lapita dates for such human impact are also found in the Bismarcks, as discussed earlier. The nearly 800 year time-lag on Guadalcanal and the lack of pottery in any of the sites so far investigated there suggests that Austronesian settlement was delayed until pottery was no longer in use in the region, but otherwise the pattern and its effect are comparable to other parts of Near Oceania, with local

indigenous populations either absorbed or displaced in the coastal areas.

Lapita represented the introduction to the region of an entirely new agricultural lifestyle and a very different attitude to the environment. The human impact on that environment increased by orders of magnitude, with previously unsurpassed levels of forest clearance through fire leading to irreversible environmental changes. For this region of the Pacific at least, the "Future Eaters" had arrived.

People were eating into their own future by causing changes within their environments which they could not control: the extinction of numerous birds and reptiles, erosion of hillsides at levels that appear to have necessitated abandonment of badly affected areas for hundreds of years, population growth rates that were unsustainable in the long term and the narrowing of lifestyle-choice in Near Oceania such that in all coastal and near-coastal areas, and indeed many inland ones, a previously hunter-horticultural economy was no longer viable.

Nunn's critique

The Guadalcanal evidence reminds us that different historical circumstances and patterns of agricultural settlement and/or adoption led to differences in the timing of the pioneer agricultural pattern in the Pacific Islands. This is important to remember as there are some who see the major environmental changes of this general time period as having a climatic explanation rather than a human one. The major exponent of this view is Paddy Nunn at University of the South Pacific in Suva.

He recounts a March 1990 visit to the inland plateau of Bucavakanayau on the island of Nayau in the Lau group of eastern Fiji. The plateau is a fern-desert or *talasiga* in local parlance. He consulted the local people he was with as to whether the plateau had always been in this degraded state: "'No,' came the reply, 'our ancestors were able to grow crops here but now the soil is no good.' I asked, 'What caused this change?' They were unsure. One man said, '*Keimami sa vakila na liga ni kalou*' (' We feel the hand of God') " (Nunn 1991:1).

Nunn suggests that minor sea level changes and climatic shifts could have led to the vegetation and landscape changes which have been documented in Fiji and elsewhere (Nunn 1990, 1991:17-28). He states, for instance, that:

> "If one allows that sea-level fall would have caused slope instability, especially in the middle parts of river valleys, and therefore would have increased sediment supply to lower reaches, there is actually no need to cite human impact to explain valley infilling and coastal progradation in the early part of the postsettlement history of Pacific Islands" (Nunn 1991:32).

It may well be that higher relative sea level between 5000 and 2000 BP could, as Nunn (1991) claims, have had an important role in shaping coastal environments, but where the sediment came from that subsequently filled former marine embayments still needs to be considered and is not adequately explained by Nunn's appeal to river channel response to changed sea level and/or coincidental occurrence of earthquake uplift (Nunn 1991:12). This is especially the case when the sediments in question are examined and found to be full of charcoal from the burning of vegetation.

Nunn's suggestion of a climatic cause is falsifiable if the human-induced impacts of initial agricultural settlement are of a similar nature in islands settled at different times. This is where the further evidence from Remote Oceania of human colonisation of islands at times later than 3000 BP becomes significant, and why the timing of the settlement of East Polynesia needs to be investigated more critically than it has been in the past (cf. Anderson 1991; Spriggs and Anderson 1993).

The conservative position on the dating of East Polynesian settlement seems supported by new evidence from Hawaii, Henderson Island, New Zealand and the Kermadecs, much of it as yet unpublished. On the best reckoning there is a major pause lasting some 1400 to 1600 years between the settlement of West Polynesia by 3000 BP during the Lapita era and the settlement of East Polynesia. The case of Mangaia in the Cook Islands where Kirch and Ellison (1994) suggest settlement by 2500 BP on the evidence from pollen cores but direct archaeological evidence begins only at 1000 BP needs more detailed treatment than there is time for here, but the main issues in contention have been discussed by Anderson (1994) in response to Kirch and Ellison's paper.

Thus it is thought that the Tahiti and Marquesas area was settled about 1600-1300 years ago, Hawaii and Easter Island about 1300-1000 years ago, the main Cook Islands about 1000 years ago and New Zealand about 700 years ago. Where faunal data is available, as in Hawaii and New Zealand, the evidence is for rapid extinction of many bird species within a few hundred years of human settlement, and significant forest clearance and human-induced erosion. Nunn's ideas fall down with the evidence for similar scales of environmental change within a few hundred years of agricultural colonisation whether it happened at 3000, 1300 or 750 BP. Later, more environmentally-friendly subsistence practices were forced on the inhabitants, and these were the agricultural systems seen by and in some cases marvelled at by Europeans.

As new data come in they seem to fit the earlier-identified pioneering pattern. Some of the latest is from the work of Steve Athens and colleagues on Kosrae in the Caroline Islands, Micronesia (Athens, Ward and Murakami 1996; see also Athens 1995). The evidence from Kosrae and from many of the other Central and Eastern Micronesian islands suggests that human settlement first occurred in this region around 2000-1800 years ago. The linguistic and some archaeological evidence is that this settlement occurred from somewhere in Island Melanesia between Manus in the north and Central Vanuatu in the south.

On Kosrae human impact on the environment came swiftly. In an environment which pre-2000 BP showed no evidence of natural fire, there is a rapid rise in charcoal deposition in swamp and other sites to a peak about 1600-1400 years ago. This signal is seen at locations in several different parts of the island, along with evidence of slope instability in the form of erosion and deposition of sediment. The natural forest of the lowlands disappears at that time to be replaced by an artificial "agroforest" with breadfruit and coconut as important components. The evidence of burning then shows an equally rapid fall-off, with fire purposely excluded from the new humanised environment.

Athens et al. (1996) see the clearance of the natural forest as a deliberate policy to replace it with a new managed environment, but I am sceptical. I see the creation of the "agroforest" as most likely representing a rapid response to the ecological disaster caused by uncontrolled forest clearance in a fragile environment. Kosrae is quite an isolated island and its inhabitants may have found they had nowhere else to go. They were forced to develop more environmentally-friendly subsistence practices or perish.

An irony of the Kosrae study and its results is that Athens and his team are firm believers in Nunn's model of natural climatic and sea level factors as being most important in creating the current Kosrae landscape. Thus the evidence for erosion is described as "localised" and the creation of the island's swampy lowlands is seen as unrelated to the products of that erosion. Paul Rainbird, in a review of Athens (1995) in *Archaeology in Oceania*, and in his recent thesis (1995, 1996) has quite justifiably pointed out the various lacunae in Athens' evidence for a natural as opposed to a human impact on Kosrae's landscape.

Using Bourdieu's concept of the *habitus* which he glosses as "community historical consciousness", Rainbird (1996) suggests that the human impact on Pacific Island environments was intentional rather than, as I have presented it here, unintentional and in the short-term disastrous. Thus, people induced hillslope erosion in order that the sediments washed down to form extensive coastal plains where the majority of island inhabitants now live and where intensive agriculture is concentrated.

At various times in the past I have toyed with similar ideas (Spriggs 1985, 1997), but the problem is the long period of time between the catastrophic erosion and agricultural use of the resulting coastal plains, as well as the continuing erosional and depositional instability which once set in train is hard to stop until everything that can erode, has eroded. I prefer to see the creation of coastal plains as an unintended consequence of human action, just as Flannery argued for the creation of swamp and mangrove areas in Australia resulting from the products of erosion washing into floodplains and estuaries. In the short-term I cannot see the result of 'pioneer' agriculture (the real ecologically-unsustainable *habitus* of these early settlers) as anything but disastrous for them.

I have already mentioned the abandonment of the Ponamla site in north west Erromango in Vanuatu as being probably due to environmental disturbance on such a scale as to render the local area essentially uninhabitable for humans. In an in press paper I have gone into detail on similar cases on Aneityum, East Futuna in the Wallis and Futuna group, and on O'ahu and Kaua'i Islands in Hawaii (now published as Spriggs 1997).

In Rainbird's 1996 thesis he discusses significant gaps in the occupational sequences of Chuuk or Truk, Kosrae, Pohnpei and Yap, attributing them to a period of "ephemeral and shifting settlements the remains of which are either washed into the sea or buried under alluvial deposits". He contrasts this with the continuous occupation sequence in Belau where there are extensive remains of agricultural terraces inland dating from soon after earliest settlement. Evidence for extensive human-induced erosion and deposition are apparently lacking, suggesting a very different approach to landscape management in Belau, a different *habitus*.

I think he is onto something here, although an alternative explanation for the gap in the other island groups is obviously that not enough work has been done and it is an artefact of sampling. Belauan is not an Oceanic Austronesian language, but is a Western Austronesian one with links directly back to Southeast Asia, from where the majority of its earliest settlers must have come rather than from Island Melanesia. Cultural differences in the way landscape was viewed and managed are therefore perhaps to be expected. But Rainbird's suggestion of long periods of ephemeral and shifting settlements in the other islands, if accepted as real, would seem to me to reflect the results of ecological disaster rather than of the planned manipulation of the environment that he has proposed.

Conclusions

There are several points raised in this discussion which I think are important. The fact that Flannery has felt able to lift a model of human impact on the environment developed over the last 20 years in the Pacific and apply it to Australia demonstrates that archaeology is in a quite primitive state of development in Australia in terms of the data available. There is at present little constraint applied by that data to the kinds of explanations that can be put forward about Aboriginal impacts on the environment. It would be as easy to construct a model of little Aboriginal impact until the last few thousand years as it is to construct Flannery's sweeping generalisation. Lesley Head's (1994) paper which I referred to at the beginning of this paper makes this clear.

We have to remember the audience, however. Flannery has written a polemical piece to scare us into taking better care of our environment. While the first Aboriginal inhabitants of Australia are the villains in the piece, they are at least seen as "like us" if us is taken to mean the immigrants to Australia of the last 200 years. They arrived in a new continent and their actions had grave effects, but by taking stock and taking hard decisions they reached a new harmony with their altered environment. The Europeans and others have come to what they thought was a new continent in the last 200 years, and like the Aborigines before them they must take stock and take action to save themselves from the unsustainable consequences of their initial mismanagement of the environment. Flannery's project is similar to much of anthropological functionalism, to show that we are all the same.

So, who is Nunn's audience? It is Pacific Island students at the University of the South Pacific. He also wants to scare his audience, but by a contrast between then and now. Then, Pacific Islanders lived in harmony as best they could with a changing environment which they adjusted to. The changes were not of their making. Remember that one of his early papers on this topic was called *Keimami sa vakila na liga ni Kalou* or "Feeling the hand of God". He concluded that paper by sermonising: "I believe that the hand of God has made as strong an impression as the hands of people on the postsettlement environments of the Pacific Islands" (1991:51). Appropriate stuff for a Methodist audience during the time of the Rabuka government's strict Sunday Observance laws!

But now, Nunn points out, new and non-natural threats have come to the Pacific, caused by evil capitalists from across the seas: global warming and

attendant sea-level rise which threatens the very existence of the vertically-challenged nations of the Pacific such as Tuvalu and Kiribati, tourism with its overwatered golf-courses on prime agricultural land and toilets busily flushing into previously pristine lagoons, and so on.

I also want to frighten people and, like Nunn, it is Pacific Islanders who are my target audience, as well as aid-donors to the region. My message is that when agricultual people first landed on the Pacific Islands they had a pioneering spirit of the "Go West, young man" type, except that it was mostly "Go East!". Their initial attitude to the environment was that it was bounteous and boundless. Having discovered one island, they thought there were more and more to be found. On empty islands, if you mucked up one valley, you could always move to the next. But in the end there were no new empty valleys and no new empty islands. They were on their own and, as in the Flannery model for Australia, they had to take stock and take action. Flannery's account of New Zealand is certainly exaggerated and I am somewhat dubious about the Easter Island case. Certainly in most cases Pacific islanders *did* forge a sustainable future prior to European contact.

Now, as island populations have recovered from the 'fatal impact' of European contact and surpassed pre-contact population levels in Micronesia, Polynesia and in some areas of Island Melanesia, they are starting to experience the second great ecological crisis in their histories. This crisis is caused by the switch in use of prime land to cash crops from subsistence cropping and the subsequent pressure to use less-suitable areas for the latter; the introduction of heavy and sharp-footed and close-cropping grazing animals such as cattle and goats; less reliance on the products of the forest with moves to a largely coastal settlement pattern in the colonial period easing the way for the entry of unscrupulous logging and mining companies; and pressures to increasing individualism and everyone for themselves attitudes at a time of rising population. I don't have any solutions to those problems. All I can do is suggest that there is a crisis and Pacific Islanders need to take stock and act to do something about it. Just as they were on their own the first time, 3000 years ago, they are largely on their own this time too and the slick prognostications of the economic rationalists of the "Pacific 2010" school of thought are unlikely to help them out in the long-term.

Some may "tut-tut" at the seeming inclusion of political messages in the varying interpretations of archaeological, palynological and geomorphological data. But I would contend that when considering such 'longue durée' evidence for environmental change, it is impossible not to draw out a 'conte morale', a moral thread to the story of humans like us acting upon and being acted upon by the environments they live in. Flannery almost certainly does go a bit over the top, but if so, as has been said of Carlos Castaneda by Richard de Mille (1978), he perhaps lied to bring us to the truth.

But in bringing the public such moral tales about the past, we must be careful that we do not assuage liberal guilt about modern environmental degradation. There are others out there always ready to put a different spin on our stories. And I will leave you with two. They are conclusions drawn from the same kinds of data discussed here, but they contain different implications. The first is from the *Honolulu Advertiser* of the 7th September 1982, soon after the first evidence was presented of the scale of prehistoric bird extinctions in Hawaii. In a dispatch from Washington, Philip J. Hilts wrote:

> "The belief that Hawaii was an unspoiled paradise before the Europeans colonized and despoiled it has been proven wrong, according to a new study by two Smithsonian Institution scientists.
>
> The Polynesians, the study says, had already destroyed much land and had burned or hunted into extinction 39 species of birds - apparently half of all the varieties on the Islands - before the arrival of Capt. James Cook in 1778".

The final quotation is much closer to home for some of you. It is a summary in the *Melbourne Age* of 22nd April 1991 of a report by Dr Ron Brunton of the Institute of Public Affairs (Brunton 1991) concerning the controversy over the proposed mining of Coronation Hill: "It [the report] says that according to the mythology of conservationists, hunting and gathering people such as the Aborigines had a special association with the wilderness." 'But there is little substance to this myth...in fact, Aborigines played a major role in altering the Australian environment,' the report says. 'They probably contributed to the extinction of many species of large animals.'
The report also describes Aborigines as Australia's first miners, 'extracting flint and ochre from deep underground mines'."

I do not conclude from this that we should not append moral tales to our analyses of the past. Indeed, it is impossible to write of past human-environment interactions without a moral component informing the analyses. We should be mindful, however, of what the effect on our audiences is likely to be. We should make the moral explicit, rather than allow it to remain implicit and therefore capable of having a different 'spin' put on it by other political animals.

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