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BOOK REVIEWS

Anderson, A. (1989) Prodigious Birds: Moas and Moa-hunting in Prehistoric New Zealand. Cambridge University Press. $99.95.

This is an outstanding book, which will, I think, for many years be a standard source and reference work. It is the fruit of a tremendous amount of research and, with the exception of a few split infinitives, very well written and readable. It is not a description of the skeleton of the Moa. For that one must still rely on the works of Archey and Oliver, and my own paper on Moa thyroid bones. The first section is a history of the discovery of Moa, theories about them, their biology, systematics, origins, morphology, and behaviour. The second section deals with Moa-hunting, archaeological sites (North and South Island), hunting methods, processing technology, chronology, and extinction.

There is a very extensive bibliography. A few references have been missed such as Hutton, F.W. (1907) The Lesson Of Evolution, 2nd edition, which contains p93f moa lists.

In the discussion on Moa skin and feathers, etc, I found no mention of the Southland Museum specimen of *Anomalopteryx didiformis* from the Te Anau cave, which has extensive remains of skin and abraided feathers. Atholl, however, has not missed much. I disagree with him on Moa classification. In the main he has adopted that of Cracraft, but I cannot accept the synonany of *Dinornis giganteus* with *D. maximus*, *Euryapteryx geranoides* with *E. gravis*, and so on. I have yet to be convinced that one can determine Moa - or any other species - by putting measurements through a computer. There are so many subtleties of shape that can be seen by eye, but not measured. In Appendix A, Taxonomies of Dinornithiformes, Atholl gives, in chronological order, the classifications of various authors so the reader can take is pick. Appendix B gives a very useful list of radiocarbon dates from natural Moa bone sites. Appendices C and D deal respectively with Moa species identified from North and South Island sites. Appendix E with such data from Moa-hunting sites (the author has culled out dates which are obviously suspect) and Appendix F lists Maori views on the period of Moa extinction.

The index, compiled by Susan Leipa, is very good but has omissions eg Australia is mentioned in the text but not in the index and people quoted in the text have many references omitted in the index.

A final point. Atholl dislikes, as others have done, the use of Moa-hunter with a capital, as it defines a culture by

only one aspect of it. This may be a valid point, but if so, then we must also cease to speak of cultures which are named from their ceramics.

All in all, I recommend anyone interested in Moa and the people who hunted them, to read this book. If you cannot afford to buy it, haunt your local library.

Ron Scarlett

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Thoughts on Prodigious Birds: Moas and Moa-hunting in Prehistoric New Zealand

Jill Hamel

Since by now most readers will have seen Atholl's book or read other reviews, I shall not even list its contents but only point out that it covers virtually all aspects of moa research, with the exception of very recent work on DNA and protein synthesis from subfossil material. It also includes much new material of great interest to archaeologists generally, such as unpublished material on Wairau Bar.

It seems pointless to consider trying to add anything of interest to what Atholl has said about moas in general, and instead I will expand on an odd historical development in the methods used by moa taxonomists. Reading Atholl's excellent analysis of the history of moa taxonomy took me back to the days when the words "numerical taxonomy" were just another piece of jargon. The history of moa classification encapsulates the history of nineteenth and twentieth century thinking about naming and sorting complicated collections of things such as living birds, fossil horses, roadside weeds and the races of man. Up until about twenty years ago the Type Specimen had a sanctity which seemed to trace back, consciously or not, to Plato's "Perfect Form", and it still has utility as a naming device. (Even well known names are ruthlessly changed by taxonomists if re-examination of a type specimen shows that it falls into a different natural population from the one it was originally assigned to.) But when I first read-up on taxonomy in the 1950s, a species was in practice a group of plants or animals sufficiently similar to the type specimen - full stop. This was dressed up with remarks about the similarity being as strong as that between parents and offspring. Later, people like Ernst Mayr added as a necessary part of the definition that the group had to be sufficiently similar to inter-breed, a notion which like Christianity created more questions than it answered.

In the 1890s, similarity to the type specimen was meant to

be the basic guide for people like Captain Frederick Hutton working on moa bones at Otago and Canterbury museums. He was a much more picky and outspoken taxonomist than most. He tried extremely carefully to explain to his reader exactly why he thought two sets of bones named as different species by Owen belonged to the same species. Owen, in the grand manner of Victorian taxonomists, did not explain how he arrived at his species, or at least he didn't explain his methods in anything that I had read. Knowing the scope of Atholl's archival work, I wondered if he would be able to make Owen's methods clear?

Sure enough in describing Owen's work on *Dinornis robustus* (Chapter 3:23), Atholl notes that Owen "exploited his inductive approach by simply shifting his ground when thwarted" and being "vague about how much observed difference in bone characters was taxomically significant". Owen did take some measurements but only to illustrate (not confirm) what he had already deduced from looking at and handling the bones. This was magnanimous of him - most taxonomists, even well into the twentieth century, simply said they had "found" or "recognised" that species A, B and C existed.

This approach should not be treated too derisively by us statistically bound, late twentieth century scientists. In one serious discussion at a time when numerical taxonomy was just starting to become popular, it was accepted that a good species was what a good taxonomist said it was. Statistical tests were not available to Owen, Hutton, Oliver, or Archey, and the combination of a good eye for shape and pattern, a good rote memory and a bloody-minded determination and patience to sort out Species A from Species B could produce effective results. We do have a complex computer inside our heads even if it is mysterious in its functioning and somewhat unpredictable.

Hutton was not satisfied with the look and feel approach, and was the first not only to take measurements but also to try to do something with them. In 1892 he published a review article "The Moas of New Zealand" (Hutton 1892), in which the description of each species includes a table of measurements of the type specimen, two to four individuals and the maximum and minumum lengths and girths which he "allows to each species". There are also other tables of means and ratios, but it was Hutton, not the figures, which decided the definition of each species.

Having handled a few measurements, Hutton suddenly became addicted to them. He was able to acquire two enormous collections of moa bones from Kapua in South Canterbury and Enfield in North Otago. The Kapua collection consisted of 749 tarsometatarsi, 645 tibiotarsi, 616 femora, 54 skulls, 230 sterna and 93 pelves. (And we think we have storage problems after excavating a few cubic metres of midden!) The Enfield

collection contained about half as many bones as the Kapua collection. This wasn't the first big group of bones that Hutton had handled, because the Hamiltons collection from the Maniototo had included about a hundred of each leg bone, but his Kapua and Enfield papers included a distinctly novel approach (Hutton 1896a, b).

Hutton measured the length, proximal width, mid-width and distal width of every leg bone and two to four dimensions of the skulls, sterna and pelves. He presented a table of "average measurements in millimetres" of the leg bones of the species which he favoured. Then he invented a type of scattergram, the infant form of cluster analysis, apparently without using graph paper. (When was graph paper invented? The French mathematician Descartes had "invented" Cartesian coordinates in the eighteenth century but that doesn't mean that "graphing" things was a commonly accepted technique.) Take a long look at Figure 1 which is reproduced here from Hutton's Kapua paper.

He measured up the bones in *inches*, decided on *a priori* grounds the genus to which each bone belonged and then noted which cell on the appropriate matrix it fell into. Thus the symbol 62h in the cell denoting a length of 11 inches and a mid width of 1.7 inches indicates that there were 62 femora of these dimensions which Hutton assigned to *Meionornis casuarinus* (a group we would consider falls into *Emeus crassus* these days). The ingenuity of the man! Now he could see the spread of each species in a series of two dimensional matrices and who overlapped with whom.

Let Hutton now speak for himself, and remember this is 1896 and the type specimen ruled.

> "In my former paper on the moas of New Zealand I took individual skeletons, or parts of skeletons, as guides for arranging the other bones into species; but the present large collection - all from one place - enables me to pursue another system, and to ascertain which bones belong to different species by the method of averages [and range of variation as well]. The advantage is that we thus find the commonest or most typical form of each species, while by the former method we may be taking an exceptional bird as our guide [a novel idea in taxonomy at the time].
>
> The result of my examination is to show that, although the species do, undoubtedly, often pass into each other, still the connecting links are comparatively rare, while the main body of the individuals of a group are well separated from the main body of individuals of another group [the fundamental principal of numerical taxonomy]; or in other words the individuals form clusters with only a few

LEG-BONES FROM KAPUA.

PACHYORNIS.

Length.	Mid-width of Shaft in Inches.																
	3·0	2·9	2·8	2·7	2·6	2·5	2·4	2·3	2·2	2·1	2·0	1·9	1·8	1·7	1·6		
23·0	..	..	..	..	..	..	..	..	..	..	1*b*	..	..	..	..	Tibia.	
22·5	..	..	..	..	..	..	..	..	..	2*b*	1*b*	..	..	..	..		
22·0	..	..	..	1*a*	1*a*	1*a*	..	..	6*b*	3*b*	4*b*	..	..	..	..		
21·5	..	..	..	..	..	..	..	..	3*b*	..	..	..	..	..	..		
21·0	..	..	..	..	..	..	1*a*	..	..	..	..	..	1*c*	..	..		
20·5	..	..	..	..	..	..	..	1*a*	1*b*	4*b*	..	2*c*	..	..	..		
20·0	..	..	..	..	..	..	..	..	..	..	2*b*	1*c*	1*c*	..	..		
19·5	..	..	..	..	..	..	..	..	..	..	..	1*c*	..	..	..		
19·0	..	..	..	..	..	..	..	.	..	2*b*	1*b*	1*c*	..	..	..		
18·5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1*c*		
18·0	..	..	..	..	..	..	..	2*a*	..	..	..	..	..	..	..		
13·0	..	..	..	..	..	..	..	..	..	1*b*	2*b*	..	..	..	..	Femur.	
12·5	..	..	..	1*a*	1*a*	..	2*a*	1*b*	6*b*	5*b*	3*b*	..	..	..	..		
12·0	..	..	..	..	..	1*a*	..	..	1*b*	3*b*	2*b*	2*c*	..	..	..		
11·5	..	..	..	..	..	..	..	1*a*	..	1*b*	1*c*	..	..	..	..		
11·0	..	..	..	..	..	..	..	..	1*a*	2*a*	1*c*	..	..	..	..		
10·0	..	..	..	..	1*b*	2*b*	..	..	..	..	..	..	..	..	..	Metatarsus.	
9·5	1*a*	..	1*a*	..	..	..	..	..	..	..	..	..	..	..	..		
9·0	1*a*	..	1*a*	3*a*	2*a*	3*b*	5*b*	3*b*	2*b*	2*c*	..	..	..	..	..		
8·5	..	..	..	1*a*	1*a*	3*a*	4*b*	7*b*	4*b*	3*c*	2*c*	..	..	..	..		
8·0	..	..	..	..	..	3*a*	1*a*	1*b*	2*b*	1*c*	..	..	..	..	..		

a. Pachyornis immanis.
b. " elephantopus.
c. " inhabilis.
e. Euryapteryx ponderosa.
f. Euryapteryx crassa.
g. " gravis.
h. Meionornis casuarinus.
i. " didinus.

EURYAPTERYX and MEIONORNIS.

Length.	Mid-width of Shaft in Inches.													
	2·4	2·3	2·2	2·1	2·0	1·9	1·8	1·7	1·6	1·5	1·4	1·3	1·2	
21·5	..	..	1*e*	..	..	..	..	..	..	..	..	..	..	Tibia.
21·0	1*e*	..	6*e*	..	1*f*	..	..	..	..	..	..	..	..	
20·5	..	2*e*	1*e*	1*e*	2*f*	..	1*h*	..	..	..	..	..	..	
20·0	..	..	..	2*e*	5*f*	5*f*	4*h*	4*h*	..	..	..	..	..	
19·5	..	1*e*	..	..	..	7*f*	33*h*	8*h*	..	..	..	..	..	
19·0	..	..	..	..	3*f*	15*f*	58*h*	27*h*	11*h*	..	..	..	..	
18·5	..	..	..	..	2*f*	3*f*	39*f*	27*h*	11*h*	..	..	..	..	
18·0	..	..	..	..	..	2*f*	11*f*	27*h*	9*h*	..	..	..	..	
17·5	..	..	..	..	..	..	4*f*	29*h*	21*h*	1*h*	..	..	..	
17·0	..	..	..	..	..	..	4*g*	5*g*	16*h*	1*h*	..	..	..	
16·5	..	..	..	..	..	..	..	3*g*	9*h*	4*h*	..	..	..	
16·0	..	..	..	..	..	..	..	..	..	4*i*	2*i*	..	..	
15·5	..	..	..	..	..	..	..	..	2*i*	8*i*	7*i*	3*i*	..	
15·0	..	..	..	..	..	..	..	..	1*i*	14*i*	17*i*	3*i*	..	
14·5	..	..	..	..	..	..	..	..	..	..	2*i*	5*i*	..	
12·0	..	3*e*	2*e*	5*e*	2*f*	..	7*f*	1*h*	1*h*	..	..	..	..	Femur.
11·5	..	3*e*	5*e*	4*e*	5*f*	7*f*	34*f*	36*h*	14*h*	1*h*	..	..	..	
11·0	..	..	1*e*	..	6*f*	4*f*	27*f*	62*h*	59*h*	10*h*	..	..	..	
10·5	..	..	..	..	..	3*g*	9*f*	29*h*	42*h*	22*h*	2*h*	..	..	
10·0	..	..	..	..	1*g*	1*g*	4*g*	..	7*h*	10*i*	6*i*	..	..	
9·5	..	..	..	..	..	1*g*	..	6*g*	..	14*i*	14*i*	7*i*	1*i*	
9·0	..	..	..	..	..	..	..	..	..	1*i*	8*i*	4*i*	1*i*	
9·5	3*e*	5*e*	1*e*	..	3*f*	2*f*	..	..	..	..	..	..	..	Metatarsus.
9·0	11*e*	2*e*	2*e*	2*f*	10*f*	19*f*	27*h*	5*h*	1*h*	..	..	..	..	
8·5	..	..	1*e*	1*f*	19*f*	40*f*	114*h*	35*h*	6*h*	..	..	..	..	
8·0	..	..	..	2*g*	8*g*	12*f*	51*h*	47*h*	18*h*	3*i*	1*i*	..	..	
7·5	..	..	..	..	1*g*	5*g*	7*g*	8*h*	15*i*	31*i*	5*i*	..	..	
7·0	..	..	..	..	..	..	..	..	5*i*	17*i*	8*i*	1*i*	1*i*	

Figure 1.

connecting links. These clusters or groups I take to be species; and this has made me abandon the following specific names formerly proposed by me, although some of them may, perhaps, have to be used in the future as varietal names ..." (Hutton 1896a:629-630). The square brackets [] indicate my comments.

Look what Hutton had done, without even knowing about standard deviations, normal populations and bell curves! He had laid out his material so that he could perceive in the pattern of the figures the normal populations in the bones and then he let the mathematical pattern play a part in deciding the species. The measurements were not just being used to illustrate a decision that he, the taxonomist, had already made. Using these matrices he reduced the number of species of moas that he recognised to 14, close to the modern consensus.

Other men, such as Parker, Forbes and Lydekker, joined Hutton in this period of "active critical analysis and productive dispute" as Atholl notes (Chapter 3:38). Curiously, subsequent taxonomists, such as Archey, Oliver, and Scarlett, did not build on this cluster technique. They used only means and ranges, though Archey did produce a diagram for *Anomalopteryx*, showing that the ratios of lengths of leg bones to one another were rather variable. Otherwise there was little or no statistical analysis and the numbers of species took off again, Oliver increasing the number to 28.

Inspired by Hutton, in the 1970s I drew innumerable scattergrams of paired variables and thought about making three dimensional structures to compare three variables at a time. Then Foss Leach introduced me to the glories of factor analysis which assumed a multidimensional universe in which the twelve basic measurements I had been taking from the leg bones could be used all at once to establish a cloud with 12 dimensions instead of the orthodox three. Like Hutton I would expect each cloud to represent a good species. Unfortunately the IBM 360 in the Otago Computer Centre had less zip than the Apple computer I am using to type this paper on, and would have taken a week to process anything like a useful number of measurements.

In 1976 Joel Cracraft at the University of Illinois used 42 variables to examine, firstly, which variables were most useful in separating species and, secondly, what groupings turned up when applied to the bones (Cracraft 1976a, b, c). In the 1970s when Oliver's and Scarlett's divisions into 20-30 species were prevalent, Cracraft's radical reduction to 13 species was startling. Hutton, however, would have recognised Cracraft's 13 species as familiar groupings very close to his 14 species - even many of the names he used have survived the ameoboid-like changes of nomenclature in the intervening 80 years. Cracraft has done a great deal more than Hutton could, of course, in his

exploration of moa relationships, and his was the first classification to depend "entirely upon objectively testable evidence", as Atholl notes with approval. But Hutton came surprisingly close.

Atholl does not enter the taxonomic fray himself, but complains that looking critically over past efforts provides him with little cause for confidence. He sees evidence for a need for further reduction of species below even the level suggested by first Hutton and later Cracraft. I agree with him that this second round of critical analysis and dispute, initiated by Cracraft, should lead to some "useful questioning and methodological inventiveness" which the subject surely needs.

References

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Walker, Ranginui (1990) Ka Whawhai tonu Matou. Struggle Without End. Penguin Books, Auckland. 334 pp. $29.95.

Ranginui Walker, Associate Professor in Maori Studies at the University of Auckland, has for twenty years been prominent in the uncomfortable world of New Zealand cultural politics. Periodic rebuttals by parliamentarians have cast him as a radical. This book is his history of Aotearoa written from a Maori perspective for a general Maori and Pakeha audience. At first sight the title and the chapter headings in Maori and the photo captions lead one to expect an antagonistic account, but the text is generally factual and moderate in tone. It is a broadly chronological narrative written in English and based

substantially on published work in English. It seeks meanings, continuities and turning points in the history of the Maori people up to 1989, from the pre-colonial, through the colonial to the beginning of the post-colonial era.

The story begins with short accounts of Maori myth, tradition and custom, much of it warmly familiar. The theological strength of myth is shown by drawing out primary dichotomies such as life and death, good and evil, sacred and profane. Its didactic wealth in providing meanings, ethics and precedents for the conduct of life is demonstrated, in matters such as kinship ties, ritual, the nature of utu and tapu, and the relationship with the land. Here lies strength for the human journey, legitimising actions, validating relationships and confirming identities. Useful at face value to a general Pakeha readership, these descriptive and explanatory chapters are as persuasive as any argument to the effect that indigenous systems of spirituality, belief and behaviour are perceived to work by those who live them, and that colonial assumptions of European religious and cultural superiority were short sighted.

Chapter 2 on migrations makes extensive reference to the work of archaeologists and relies heavily on Roger Duff's Moa-Hunter Period of Maori Culture (1950) and Janet Davidson's Prehistory of New Zealand (1984). As an attempt to integrate the results of archaeology with Maori myth and tradition, and to dispel for a general readership the old constructs of the Great Fleet and the Moriori Myth, the effort is laudable. Unfortunately some of the interpretation quoted is outdated. A broad scale subsistence Moa-Hunter culture, a later development of gardening associated with the beginnings of defended pa, and even the pit dwellings theory, are unearthed from the myths of New Zealand archaeology. There is over-simplification of some of Philip Houghton's statements from The First New Zealanders (1980). Ranginui Walker must receive marks for his intention to describe cultural change, but he loses some for unsystematised and uncritical use of archaeological sources.

The principal thrust of the book begins with the nineteenth century and the colonial period. The treatment of the missionaries is merciful, avoiding reductionism or even a critique of their intentions. It is recognised that the Maori sought the benefits of trade, literacy and industrial skills, but that they wished to retain a meaningful degree of autonomy. The event and the texts of the Treaty of Waitangi are given appropriately detailed coverage, emphasising the difference between what the Maori thought they gave and what the coloniser claimed. The post-Treaty story centres on the misery of the wars, the alienation of land and failed attempts to obtain redress. The account is selective. To fill gaps it is helpful to have on hand Claudia Orange on The Treaty of Waitangi (1987) and James Belich on The New Zealand Wars

(1986). There is little disagreement that although the Maori won many battles, they lost the wars and by degrees the land, despite the assurances of the Treaty. It is necessary repeatedly to state that consultation with the chiefs could have avoided trouble and that responsible Maori advice and requests for involvement in the political process were ignored.

Ranginui Walker devotes a third of his book to the twentieth century, and half of this to the last ten years. These later chapters are more thematic than strictly chronological, and deal with national politics, Maori leadership structures, the history of Maori cultural renaissance and activism, and recent changes in the law allowing decisions in accordance with the spirit and principles of the Treaty. This all makes for a good read through familiar material. There are justifiable jibes at inflammatory and historically uninformed newspaper headlines. The roles of radical and conservative, Maori and Pakeha are traced. Although the space allocated to recent events may be questioned in a book purporting to be a general history, the significance of the political changes of the 1980s is enormous as trends of the previous century and a half are seen suddenly to reverse. With legislation, the judicial process and the policies of government departments beginning to occupy thought worlds once considered those of the lunatic fringe, Aotearoa is seen to have arrived in the post-colonial era in which Maori faith in the meaning of the Treaty is vindicated.

A history of the Maori to this point explains the very broad and abiding senses of loss, grievance and expectation over land and government which lie at the foundation of visible discontent. It gives the background to attitudes archaeologists may encounter in matters such as reserve land. The nature of the human spirit ensures that the struggle will continue. The past is seen to be all important and will be an increasingly researched focus of political and legal action. Archaeologists are implicated. The book is recommended for those unfamiliar with the story.

Aidan Challis

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Sutton, D.G. ed. (1989) Saying So Doesn't Make It So: Papers in honour of B. Foss Leach. N.Z. Archaeological Association Monograph 17.

I first met Foss as undergraduates early in 1964. His energy is undiminished and he pursues his interest in archaeology with the same single-minded vigour now as he did then. As a teacher, he instilled into his students the same enthusiasm. The high regard in which they still hold him is

reflected by this volume of essays written by his former students in honour of his retirement (from teaching only) after 22 years.

The volume contains 17 papers, and one biographical sketch. The sketch is the most interesting part of the book, as much for what it omits as for what it includes. Nevertheless, Doug Sutton has given a concise and readable account of Foss's career and the factors which influenced his professional approach to archaeology. For the rest, there are some things which should remain unwritten, to become established and grow in legend.

Foss's interest was probably stimulated first while a child in Martinborough, under the guiding hand of Dr Budd, the local G.P. It was certainly developed while as an undergraduate at Otago University by, amongst others, Les Groube, Peter Gathercole, and Ham Parker. He planned and led jointly, with Helen Leach, the Wairarapa project, the first large scale archaeological research programme ever held in New Zealand. Many of the students involved in the project are today part of the archaeological "establishment" in New Zealand.

Foss was convinced that science had an important role to play in archaeology and taught his students accordingly. It is no surprise that 12 out of the 17 papers apply some aspect of scientific methodology in such diverse topics as archaeozoology, lithic and technological studies, palaeobotany, dating and physical anthropology. The remaining five papers are historical essays and settlement pattern studies.

There are three historical essays. "Anthropologist at war" is a very readable account, by Roger Fyfe, of H.D. Skinner's experiences at Gallipoli compiled from letters and diaries. Stuart Park provides an historical survey of Pacific stone adze studies carried out by H.D. Skinner and Roger Duff, and Atholl Anderson discusses the implications of the Bayard Booth diary of excavations (1875) at the Shag River moa-hunting site.

Under the general heading of Archaeozoology, Ian Smith describes the impact of the Maori on the marine megafauna in New Zealand. Medullary bone is a granular bony deposit which develops only in the bones of female birds during egg-laying and its use in determining seasonality and sex of archaeological remains is dealt with by Rick McGovern-Wilson. Doug Sutton analyses fish remains from Moriori middens on Chatham Island and concludes that sixteenth century fishing at Durham Point was predominantly inshore.

Lithic and technological studies includes four papers: water absorption testing of Pacific pottery, by Michiko Intoh; Mangaasi pottery and the Mangaasi site, by Graeme Ward;

sourcing of New Zealand obsidian using XRF, by Andrea Seelenfreund and Charles Bollong; and a lithic assemblage from the Kauri Point pa at Birkenhead, by Kathy Prickett.

The section on Paleaobotany has a paper on the nutritive value and cooking of cabbage tree, by Barry Fankhauser; and a report by Rod Wallace on the different woods used for making the artefacts from Hine-i-te-Hutu's swamps. More information on the provenance of the artefacts would have been helpful, but nevertheless, some 37 wood species were identified from 762 items. For each type of artefact, which ranged from house panels to combs, there appears to have been a short list of preferred woods.

Settlement pattern studies include aspects of pa studies at Tologa Bay by Kevin Jones; and archaeological evidence for whaling, subsistence and settlement on the west coast of Vancouver Island, British Columbia, by Yvonne Marshall.

Current research into electron spin resonance as a possible alternative dating method to radiocarbon is described by John Dennison under Dating. As yet no dates have been produced, but the method looks promising.

The final section, Physical Anthropology, includes the incidence of dental caries in some prehistoric Pacific groups, by Jennifer Evans; and diet reconstruction from human bone trace element analysis, by Michelle Horwood.

The papers are an impressive collection, wide ranging in topic, geographically, and in time. Their quality and diversity are a testimony to Foss's effectiveness in teaching, and of the standards engendered in his students.

Bruce McFadgen

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