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Ancient Peoples and Places

THE PREHISTORY OF AUSTRALIA

General Editor

DR GLYN DANIEL

ABOUT THE AUTHOR

Born in Victoria, Australia, Derek John Mulvaney obtained an Honours Degree in History at the University of Melbourne in 1948, and went on to complete a Master's thesis on British Iron Age Prehistory two years later. In 1953, having taken the Archaeological and Anthropological Tripos at the University of Cambridge, he returned to Australia as Lecturer in Ancient World History at Melbourne, and at the same time began field work. In 1965 Mulvaney moved to the Australian National University, where he is a Senior Fellow in Pre-history in the Research School of Pacific Studies. Since 1964 he has been a Council Member of the Australian Institute of Aboriginal Studies, and was awarded the Royal Society of Victoria Research Medal for 1963. He is author of a Manual, Australian Archaeology: A Guide to Field Techniques.

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D. J. Mulvaney

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THIS IS VOLUME SIXTY-FIVE IN THE SERIES
Ancient Peoples and Places
GENERAL EDITOR: DR GLYN DANIEL

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FIRST PUBLISHED 1969
FILMSET BY KEYSPOOLS LTD, GOLBORNE, LANCS AND
PRINTED IN GREAT BRITAIN
BY FLETCHER & SON LTD, NORWICH
NOT TO BE IMPORTED FOR SALE INTO THE U.S.A.

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To the memory of J. L. O'Brien,
who led me from History,
through Protohistory,
to Prehistory

Introduction

THE DISCOVERERS, explorers and colonists of the three million square miles which are Australia, were its Aborigines. In the polemics of nineteenth-century evolutionary controversy, when men declared themselves for apes or angels, the Australians were ranged firmly on the side of the apes. Their persons, social institutions and material equipment were cited as survivals from the dawn of mankind, exemplars of brutish savagery. The facts are otherwise. Australia stretches from about 43 degrees South latitude to within 11 degrees of the Equator, while a third of the continent lies within the Tropics; in recent times an equal area has received an average rainfall of less than ten inches; it is further from Perth to Melbourne than the distance separating London and Moscow. The dispersal of the Aborigines throughout this vast land, their responses and adjustments to the challenges of its harsh environment, and their economical utilization of its niggardly resources, are stimulating testimony to the achievements of the human spirit in the face of adversity.

Carstenz, a Dutch navigator, collected Aboriginal ethnographic specimens back in 1623; Governor Arthur Phillip conducted an archaeological excavation in 1788, a few weeks after the settlement at Sydney; during the 1840s, George Grey and Edward John Eyre, two distinguished explorers who later gained fame in the field of British colonial administration, contributed sympathetic memoirs on Aboriginal society. With such auspicious stirrings of early interest, great progress in Aboriginal studies might have been predicted. Unfortunately, this expectation was unrealized, particularly in the prehistoric field.

In 1961, I designated Australia 'the dark continent of prehistory' and offered the opinion that many years would elapse before an Archaeology of Australia could be written. Although

the position has improved immeasurably, this sketch is tentative and necessarily selective, while a definitive text remains a hope for some prehistorian of the next decade. The 1960s represent a watershed in Australian prehistoric research, as there has been an upsurge of interest within several universities and museums. The first graduates in prehistoric archaeology from the University of Sydney are engaged currently upon doctoral research at the Australian National University, Canberra; some museums have appointed staff archaeologists. Resulting from a conference held in 1961, the Commonwealth Government established the Australian Institute of Aboriginal Studies, which has co-ordinated and financed research on an ambitious scale, thereby facilitating developments at other institutions and enabling comprehensive field projects.

Since 1963, disciplined field investigations have been undertaken in every state of the Commonwealth, although only a fraction of the area has been reconnoitred and basic gaps in knowledge abound. The finds resulting from this intensive research are being analysed, but few detailed reports have been published. This explains why I draw heavily upon my own experience and why some fundamental problems are treated in a general manner.

My own involvement in Australian prehistory pre-dates this stimulating advent of young, skilled, field archaeologists by some years. This book may serve, therefore, as the impressions of a prehistorian at the climactic period when imminent publication of sundry excavation reports, and the application of newer techniques to old evidence, may force a re-evaluation of ideas. Detailed regional studies also will ensure a fairer understanding of the varieties of Aboriginal response. It is a matter of personal satisfaction that some of this recent work has been carried out by students working under my supervision.

While it is convenient to terminate Australian prehistory in 1788, with the permanent British settlement at Sydney, it is a

misleading rule of thumb to apply to a continent, and precise terminological definitions are difficult. For example, settlement in near-by Victoria was delayed until 1834, while in the Northern Territory, after half a century of false starts, European permanency was achieved only in 1869, with the settlement at Darwin. Earlier colonies in tropical Australia, and many accounts of early sea contacts or land explorations, stand in the same relation to Australian prehistory as Caesar's *Commentaries*, or details of Commius' flight from Gaul, concern prehistoric Iron Age Britain. The fitful insights into prehistoric societies and personalities which such sources provide are best termed protohistory.

In this sense, it was eastern seaboard protohistory which was transformed into history in 1788, because Captain Cook's explorations eighteen years previously illuminated aboriginal society. Yet, if protohistory extended in this area only from 1770, other Australian regions experienced 250 years of protohistoric time before their effective historical phase opened. In this book, the term 'protohistory' normally designates that period between first alien contacts and the effective European occupation of a region. When referring specifically to Aboriginal society, even during this protohistoric phase, the term 'prehistory' is used; it is easier not to draw the bounds too firmly. One is reminded also, that geographical frontiers in prehistory can raise difficulties. There is that salutary example of the dust jacket around a famous book on prehistoric Ireland, upon which the Six Counties were demarcated. I am aware that state boundaries were not recognized in prehistoric Australia, but it is convenient to pretend that they existed for ease of presentation.

Neither the bibliography at the end of this book, nor the preceding annotations which are arranged by chapters, is exhaustive. The basic sources are indicated, but except when there are particular reasons for referring to a specific work or author, I have followed the practice of only referring to those recent sources which provide more complete bibliographical guidance or

critical evaluation. This is a personal appraisal, much of which may be rejected by other workers, or by time. It does adopt the viewpoint that it is the people and not their relics which are the justification for attempting to tell the story. Since it is a personal statement, necessarily phrased in general terms because of limitations of space and the unlimited potentialities of the subject, I refer enquiring or doubting readers to my other works listed in the bibliography. More detailed evidence or analysis is provided there, particularly in my two contributions to the *Proceedings of the Prehistoric Society*, for 1961 and 1965.

Many people assisted with the preparation of this book. Although they are in no way responsible for the views expressed in the text, J. H. Calaby and J. Golson read it and offered constructive criticisms. Crucial unpublished information and photographs were supplied freely by the following, without whose co-operation parts of the book could not have been written; any interpretations placed upon such material are my own: F. J. Allen, D. A. Casey, I. M. Crawford, Rhys Jones, R. J. Lampert, F. D. McCarthy, C. C. Macknight, Isabel McBryde, J. V. S. Megaw, D. Merrilees, D. Moore, A. West, Carmel White, R. V. S. Wright. The X-ray photographs were taken by T. Leaney, at the Canberra Community Hospital. Other individuals who supplied photographs are mentioned in the 'Sources of Illustrations' list; their assistance is gratefully acknowledged here.

The following institutions loaned me material and supplied me with information: The Institute of Anatomy, Canberra; The National Museum of Victoria, Melbourne; The South Australian Museum, Adelaide; The Australian Institute of Aboriginal Studies, Canberra.

The line illustrations are the sole work of Winifred Mumford, Research Assistant in this Department, to whose patience, imagination and skill my indebtedness is visually apparent. Many of the detailed illustrations were photographed in our

studio by W. R. Ambrose, who devoted much time to their production. To Robert Edwards, Curator of Anthropology, South Australian Museum, my thanks are due for his cheerful companionship in the field and for his generosity in supplying me with copies of his valuable photographs of art and material culture. Many of these were taken during the course of field work sponsored by the Australian Institute of Aboriginal Studies. For their patience and discrimination in typing the script, I am indebted to Lois White and Lesley Howard.

To Dr Glyn Daniel who first invited me to write this book, and to the publishers, I am grateful for their tolerance and advice during an unduly extended period.

D.J.M.

When the proofs of this book were corrected, important additional information had become available. Further radiocarbon dating of Koonalda cave samples establishes that the early occupation date is of the order of 22,000 years and not 31,000 as mentioned in the text (pp. 151, 178). On the east coast, occupation at Burrill Lake shelter (p. 146) dates from around 20,000 years ago. R. A. Gould's site (p. 150) Puntutjarpa, Warburton Ranges, Western Australia, produced the oldest known microlithic blade industry, dated (I-3387) to 6740 ± 120 B.P. (4790 B.C.).

At Laura shelter, Cape York, the lower levels (pre-7000 years) contained ground flakes, thereby extending the early range of presumed edge-ground axe distribution beyond Arnhem Land (pp. 110, 143). Ethnoarchaeological research in New Guinea has suggested a function for so-called fabricators to J. P. White (pp. 90, 141). He observed that small stones battered to remove flakes, developed the characteristic bruised margins, although they are classifiable as cores. In the light of I. C. Glover's fieldwork (p. 116), correlations between Australian and Timorese stone industries appear untenable. In *Records of the South Australian Museum*, 15 (1968), N. B. Tindale presents evidence on prehistoric cultures and criticises the author's interpretation.

Protohistory

What there is in this South-land, whether above or under the earth, continues unknown, since the men have done nothing beyond sailing along the coast; he who makes it his business to find out what the land produces, must walk over it, which these discoverers pretend to have been out of their power. . . .

ANTHONY VAN DIEMEN, 23 December 1644, commenting on the results of Abel Tasman's second voyage to Northern Australia

AS THE 'INVESTIGATOR' worked to the south-west around Cape Wilberforce in squally, monsoon conditions, frequent tacking was necessary. After 105 days of coasting the Gulf of Carpentaria, Matthew Flinders had concluded his meticulous charting of its waters, on 17 February 1803. A few hours later, six ungainly vessels hove in sight, sheltered within a strait between islands off the Arnhem Land coast. Flinders summoned all hands to action stations, to display their puny armament.

THE FIRST ENCOUNTER

Flinders anticipated piracy, but the result was more mundane; the only exchanges were pleasantries and a British flag. These wooden praus, usually of from 10 to 25 tons, equipped with oblong fibre matting sails, bamboo slatted superstructures and two steering oars, had sailed out of the southern Celebes harbour of Macassar, two months previously. Their purpose was to collect and process bêche-de-mer (sea-cucumber, or trepang). Flinders learned from Pobassoo, the venerable Bugis squadron commander, that 60 praus and over 1000 men were working on the Arnhem Land coast that season. Flinders named an island in Pobassoo's honour, and the place of their meeting, Malay Road. Plate 1

This was a symbolic moment in Australian protohistory, when Asian and European first met in territorial waters. Although for centuries, European and Asian nations had been potential arbiters to the fate of Australia's prehistoric population, positive intervention was deferred until the age of the Industrial Revo-

lution. Seafarers, both accidental and intentional, had skirted the western and northern margins and some had stepped ashore; but Australia presented an unattractive vista to these fleeting visitors whatever their colour, class or creed. Even the Macassan trepangers skudded home annually; they left behind them no permanent colonies, forts or factories in this alien land which they knew as Marege (a derivation from Pamarege—a trepang fisher—although its connotation in some European sources is better rendered 'land of the wild men').

In the chronicle of protohistoric contacts with the Aborigines, it is interesting to reflect that Flinders represented a new phenomenon in northern waters. Unlike earlier voyagers driven on by the westerly gales in the roaring forties, or sailing out of Asia, he embarked from an Australian base and bore the British flag north and west from Sydney. Neither was he repelled by what he observed of man and nature in tropical Australia, as had so many sailors before him. Perhaps his attitude is to be explained by his acclimatization on the kinder eastern seaboard and by the fact that he was not a merchant venturer seeking profitable returns. But Flinders was also a product of that intellectual climate of opinion, the Age of Reason, when men described and evaluated the natural world in more objective terms. Unlike many of their predecessors, they were concerned to provide factual accounts of peoples and places. Often a tinge of uncritical romanticism led them (but not Flinders) to populate the new lands with improbably noble savages, but experience usually taught them that all men had warts and that some were less noble than others. The significant point, however, is that this generation of explorers saw native populations as *men*, and this spirit infuses their work.

Flinders' landscape artist, the talented William Westall, is an interesting example of these intellectual influences. His delineation of the Macassan praus in Malay Road was accurate, while his economical portrait of Pobassoo endowed its subject with personality. Indeed, through Westall's eyes and Flinders' pen, Pobassoo

emerges as the first individual Asian in Australian prehistory. Later, with Westall in a mellower mood, and with the assistance of the English engraver who rendered his oil painting suitable for contemporary taste, his vision from Pobassoo Island changed subtly. The landscape is vibrant under a threatening sky, the praus merge into the sea, and a statuesque 'savage' contemplates a romantic 'south seas' setting. Plate 1 Plates 2, 3

This confrontation of Europe and Asia in 1803 heralded the imminent reversal of the tide of cultural diffusion, which throughout Australian prehistory had run from Asia to Australia through Island South-East Asia. During historic times, the success of this reorientation of cultural transmission, now directed from southern Australian cities, became evident in Arnhem Land as successive attempts were made to colonize it. On a recent visit to a former trepanging area, I found that transistor radios were standard 'out-back' Aboriginal possessions, while a group of children on a Mission settlement were more familiar with Paul, the Beatle performer, than with the teachings of St Paul.

EUROPEAN DISCOVERY

Schoolchildren are taught that the first discoverers of Australia were Europeans. They know that the Spaniard Luis Vaez de Torres almost won this honour in 1606, by sailing through the strait which bears his name; but he hugged the New Guinea coast. By a coincidence Australian shores were charted earlier in the same year, by a Hollander, Willem Janz, who reached western Cape York Peninsula. However, it is probable that the children are misinformed concerning these priorities, although it is impossible to clinch the argument by citing earlier navigators whose records are of comparable quality to those testifying to the fleeting Janz episode.

Some historians dismiss this matter of priorities as idle speculation; the shape of the first sandal- or boot-print on Australian shores is not their concern. To Andrew Sharp, writing a book on *The Discovery of Australia*, Asian evidence for contact was irrelevant to his theme: 'their knowledge made no impact on the world

at large or on the history of Australia'. The truth is, however, that visits to prehistoric Australia did have repercussions for the Aborigines living there, and sometimes this alien influence was profound. This first chapter examines this intriguing problem, in order to demonstrate that it is a field of real and appropriate archaeological investigation.

Europocentric historians of exploration have been inclined to assume that those lands unknown to Europeans existed in some limbo of uncharted and static seas, awaiting redemption by some imaginative navigator. As a corollary and by definition, any island was remote and isolated. European prehistorians were alerted to the fallacy of the 'landlubber' mentality some years ago, when Tom Lethbridge published his provocative essay *Boats and Boatmen*. He observed that Atlantic seas positively facilitated migration and culture contact, while land imposed vital barriers. This profound truth has exciting meaning in the Polynesian world, as Andrew Sharp's equally tendentious study of *Ancient Voyagers in The Pacific* demonstrated.

Australian prehistory cannot be understood without an appreciation of the same factors. At every phase of its prehistory Australian isolation from Asia was more apparent than real. Contrary to the opinion of earlier writers, Australia was not a remote, sea-girt, cul-de-sac; indeed the physical barriers of distance and aridity within the continent were possibly more significant factors conducive to cultural isolation.

Fig. 1

TRADE-WIND NAVIGATION

Northern Australia firmly straddles the monsoonal belt, which for several months brings the moisture-laden winds of the north-west monsoon from Island South-East Asia. Even today, lost or disabled Indonesian fishing craft are blown ashore in Arnhem Land, while remote beaches are strewn with coconut husks, sawn lengths of bamboo and other intrusive flotsam. George Windsor Earl, a visitor to the islands east of Timor and only 300 miles from Australia, observed of their seafaring inhabitants around 1840, that nearly every village mourned the loss of praus

blown to the south-east. Writing around 1600, Manuel Godinho De Eredia, recorded several examples of Portuguese and native craft and one Chinese junk, being blown to the south of various Indonesian islands by the monsoonal winds.

Because of the constancy of these winds, the trepang fleet out of Macassar made its journey of over 1200 miles to an Arnhem Land landfall within ten to fifteen days, including a final stretch of about four days without sight of land. Indeed, the problem was to control craft travelling at perhaps five knots at the end of its voyage, so that the prevailing wind did not blow it aground. It is recorded that four praus were wrecked on Melville Island in this fashion during 1847, while in 1890, three of the fleet of thirteen praus were lost. Before the monsoonal season ended, the surviving craft spread out in squadrons and combed the shallow harbours of Arnhem Land and the Gulf of Carpentaria, often reaching the Sir Edward Pellew Group, over 700 miles distant to the south-east. Plate 4

The Kimberley coast of north-western Australia and Cape York Peninsula were other potential areas where culture contact was facilitated by the monsoons. Large fleets of trepanging praus were observed off the Kimberley coast during the nineteenth century. At that time, a large Bugis ('Macassan') population lived on Sumbawa Island, and they were associated with the Australian trepang industry. It is probable, but unproven, that they sailed with the monsoon direct from the Sumba region, an ocean crossing of perhaps 500 miles. It is not surprising that the west coast industry was considered to be more hazardous than work in northern coastal waters, but the superior quality of the catch provided an incentive for the journey. It is possible that archaeological field work may reveal contrasting material relics on Kimberley and Arnhem Land trepanging sites, reflecting such different points of departure for the praus. A field project is in hand on evidence for 'Macassan' contact with the Kimberley coast, by I. M. Crawford, of the Western Australian Museum.

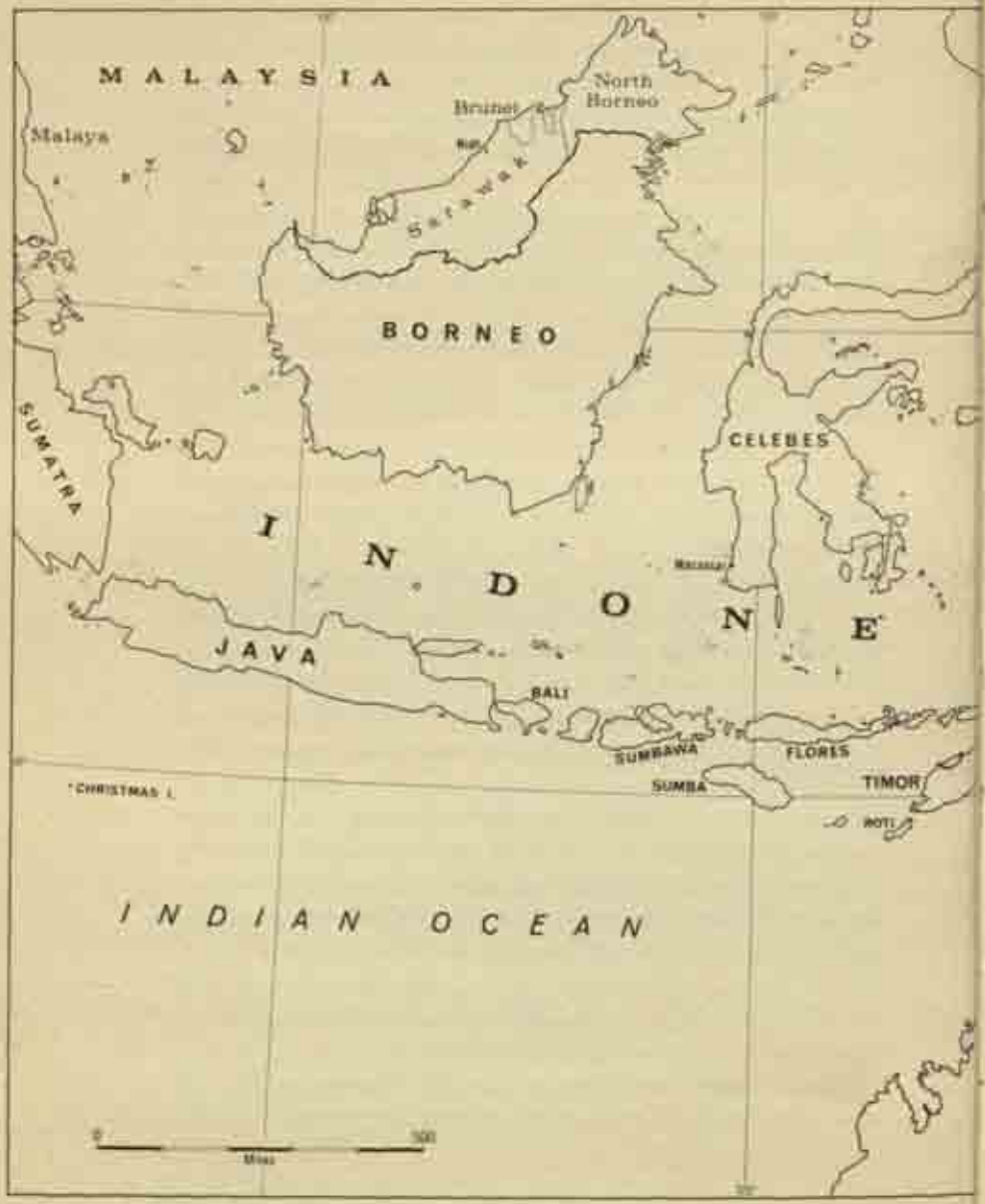


Fig. 1 Island South-East Asia and Tropical Australia


PHILIPPINES
PACIFIC OCEAN
MOLUCCAS
CERAM
BANDA IS.
ARU IS.
TANIMBAR IS.
West Irian
Territory of New Guinea
NEW GUINEA
Papua
Timor
Arafura Sea
Melville I.
Coburg Peninsula
Darwin
Arnhem Land
Gulf of Carpentaria
Groote Eylandt
Cape York Peninsula
Kimberley
AUSTRALIA

It follows that, if the monsoon facilitated the outward journey, the return to Island South-East Asia was equally feasible when the south-east trade winds blew after late May. The knowledge of this fact is one of the tantalizing elements in Eredia's tale of Chiaymasiouro, a ruler of south-eastern Java in 1600, who voyaged 500 miles south (and east?) of Java for twelve days. The fact that he visited a fabulous land is irrelevant here. What is significant, is that 'when the southerly monsoon winds set in, he started back for his own country', and arrived there safely in 1601.

Whether the Australian route was a unique, accidental discovery (as Pobassoo informed Flinders), or whether it happened on many occasions from various islands (as seems probable), the circumstances necessitate that the coast was frequented by many alien visitors. These intriguing archaeological prospects in tropical Australia offer an interesting parallel with Roman Imperial history. Roman captains trusted the monsoons to speed them direct across the Indian Ocean to India and back to Egypt. It also raises a new perspective for Australian protohistory, by changing the emphasis from the conventional problem pondered by earlier historians, who asked how and why Australia was 'discovered' in the seventeenth century, to an assumption that evidence of earlier discoveries will be forthcoming.

THE TREPANG INDUSTRY

Australia's first export industry was based upon the knowledge of the monsoons; the commodity was the trepang (bêche-de-mer), a member of the Class *Holothuroidea* and the animal phylum *Echinodermata*. Soup made from the dried body wall of certain species was in demand in China both for its culinary and its alleged aphrodisiac properties. At Canton a century ago, thirty varieties were traded and the Australian product was sold as average quality. Controlled by Chinese merchants chiefly resident in Macassar, it was a major industry from Borneo to the Aru Islands and Australia. Around 1820 trepang was said to be the largest Indonesian export to China.

Explorers Flinders and P. P. King investigated the Australian industry in territorial waters and in Timor, and concluded that a single prau might contain 100,000 dried trepang, weighing about five tons. On this estimate, therefore, the sixty praus constituting the 1803 fleet caught and processed six million animals. J. Crawfurd, who was Sir Stamford Raffles' assistant in Java between 1808 and 1817, estimated a prau's cargo at only three tons, but observed that 'the fishery of the trepang is to China what that of the sardine, tunny, and anchovy is to Europe'.

The industrial process within a shallow bay might occupy from a few days to three weeks. The trepang was either collected by hand, speared or trawled. Small dug-out canoes, termed 'lepa-lepa', were carried on the praus for this purpose. (King observed nineteen canoes supplying four praus.) The Aboriginal 'lippa-lippa' canoe is a direct imitation. Praus were grounded on sandy beaches, an encampment was made ashore and stone fireplaces were constructed adjacent to mangroves, whose wood was used for boiling the animal; large iron cauldrons were carried for the boiling process. After a preliminary boil, the trepang was gutted and re-cooked in a tan of mangrove bark which coloured and flavoured the flesh. Subsequently it was dried and de-calcified by burial in sand, then smoked in prefabricated bamboo and rattan sheds transported for the purpose. Small wonder that Alfred Russel Wallace described the trepang he saw processed in Aru as 'looking like sausages which have been rolled in mud and then thrown up the chimney'.

MACASSAN CONTACT SITES

The field archaeologist in Arnhem Land has a relatively simple task to locate potential Macassan trepanging camps. The requirements are deep water and sandy beaches in situations affording protection from the winds and easy access to supplies of mangrove wood. Defence was a further requirement: these sites are on small islands or promontories, because relations with the Aborigines were often poor. European sources contain numerous references to massacres of prau crews and retaliatory

measures by the Macassans. The situation must have fluctuated regionally and with time, because these same sources contain evidence for amicable and mutually profitable economic relationships. There are also references to Aborigines travelling as crewmen on the praus and in the 1870s there was an Aboriginal community marooned in Macassar. Some idea of the intensity of Macassan exploitation within a harbour and of the disposition of their camps, is provided in an Aboriginal drawing of Melville Bay, which is topographically recognizable.

Plate 12

Fortunately for archaeologists, the trepangers brought with them the astringent fruit of *Tamarindus indicus* which seeded prolifically in places. Tamarind trees serve as botanical markers for their camps, because their height and rich green foliage contrast with the flat seascape. Upon inspection, the area around tamarind trees is sometimes covered with a scatter of potsherds, bottle glass and stone hearths.

Fig. 7

The archaeology of 'Macassan' contact with Arnhem Land is under current investigation by C. C. Macknight, Australian National University. His most extensive excavation is on a small promontory in Anuru Bay where the trepanging occupation covered several hundred square yards, and the surface produced hundreds of potsherds. There were fourteen embayed stone structures, each one apparently intended to hold about five vats, but it remains to be determined whether they were all in use simultaneously. Ashy depressions possibly mark the sites of former smoke-houses, because their floors were hollowed out in order to protect the inflammable walls from the smoke fires, while hollows dug behind the stone lines indicate where the cooked trepang was buried, preparatory to smoking. Many explorers describe the restless activity within an encampment, and fortunately a French artist depicted the scene in Raffles Bay in 1839, during the visit of Dumont d'Urville. Two burials excavated at Anuru Bay are non-Aboriginal and are material substantiation of the industry's high mortality rate referred to in many sources.

Plates 5, 7

Plates 4, 6

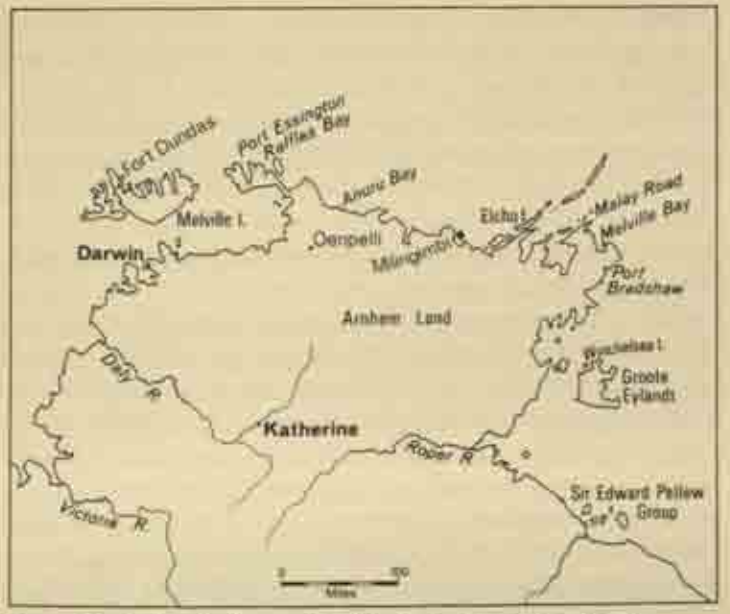


Fig. 2 The Arnhem Land coast and the 'Top End' of the Northern Territory

The ceramic evidence from trepanging sites is under investigation both by Macknight and I. M. Crawford. Decorated sherds are uncommon and plain red ware is ubiquitous. So also is glass from square-faced bottles, including some prunts with Dutch trade names. There is no evidence to support some Aboriginal traditions that pottery was manufactured in Australia by the trepangers. During the nineteenth century, the praus apparently used some pottery manufactured in the Kai Islands, west of Aru, but the bulk of it probably came from the Celebes. Unfortunately, there is little to differentiate the undecorated ceramics, and much modern pottery throughout Island South-East Asia is comparable in form and size. Most pots were globular, with rounded bases; although the size varied, rim form was similar, and generally, the fabric was thin and fragile. Thin

Plate 8

Plate 9

section analysis may provide useful data. There is a remarkable homogeneity in the ceramic evidence around hundreds of miles of coastline, on the sixty or more sites investigated by Macknight. Far Eastern porcelain fragments, many of them attractive pieces, occur commonly on these sites. This constitutes another important problem awaiting typological and chronological definition. The prerequisite seems to be objective studies of mainland Asian porcelain, with emphasis on common, cheaper wares, rather than on art museum pieces.

ANTIQUITY OF TREPANG TRADE

One of the purposes of Macknight's research is to date the antiquity of Macassan contact. Flinders was informed that it commenced around 1780, while other early investigators also adduced relatively recent origins. Absolute chronology resulting from archaeological activity may alter the perspective, although present evidence confirms it. The Dutch bottles identified so far are nineteenth-century. Three bronze coins of the Dutch East India Company were found by Mission authorities at Elcho Island, on a trepanging site described in use during 1882. Two coins are dated 1790 and the third is 1838. A single radiocarbon estimation for charcoal from the Anuru Bay excavation provided a 'modern' age, and recently in his excavations on sites on islets adjacent to Groote Eylandt, Macknight recovered a coin similar to the Elcho specimens dated 1780, and a corroded specimen probably dated 1746.

Plate 11

Social anthropologists anticipate greater antiquity than this, however, for racial contact between Macassarese and Aborigines. It is now realized that its impact upon Arnhem Land society was profound. In addition to such material contributions as the dug-out canoe and sail and metal implements, which probably enabled a more successful exploitation of the environment, the influence was more pervading. Macassarese words were adopted into the native vocabulary and local place-names still bear witness to this linguistic borrowing, and in the nineteenth century it resulted in a lingua franca around the coast. Socially, the reper-

cussions varied from the wearing of the now characteristic Arnhem Land Van Dyke beard to the adoption of the Malayan smoking pipe. Artistically, the influence on eastern Arnhem Land bark-painting motifs was profound, and in the same area it is possible that it resulted in the introduction of sculpture in the round.

SOCIAL RELATIONS

More complex than these factors were the ceremonial and mythological repercussions of Macassan contact, which anthropologists have discerned as vital to Arnhem Land Aboriginal ritual and belief. There is an intriguing episode related by Donald Thomson. During the 1930s he found that a clan on the Glyde River had adopted as its totemic symbol, a square-faced bottle: those green liquor bottles so ubiquitous on Macassan sites. Thomson found that a copy of such a bottle had been carved from wood, and that the painted design which covered it represented a complex ritual account, linked directly with trepanging. This, he inferred, was a recognition of the economic and social value of glass (and its contents!). Its relevance here is that a foreign object had been incorporated into Aboriginal mythology and social organization. But there are many further examples drawn from ceremonial song cycles and rituals which prove the integration of the two cultures, despite their evident antagonisms during everyday transactions. It is therefore a matter of considerable theoretical interest to ascertain the duration of this trepanging contact period, in order to evaluate the rate at which non-material traits were assimilated into a culture traditionally termed 'conservative'.

Plate 13

One possible consequence of Aboriginal hostility was that the trepanging contacts were fleeting, albeit regular. The nomadic industrial organization of the trepangers produced few permanent structures except for the stonework around their boilers and wells sunk for water. They brought with them their trepanging gear and canoes, together with cauldrons, prefabricated huts, racks, roofing and smoke-houses. It is significant that their first attempt at colonization was a consequence of British activity in the area.

The abortive British settlement at Raffles Bay in 1827 was followed within three years by the arrival of Macassan families; but finding the settlement abandoned already, they returned home. In 1839, a few months after the foundation at Port Essington, the praus arrived there in strength. In the words of J. L. Stokes, captain of H.M.S. *Beagle*, 'their owners solicited permission to erect their establishments for curing trepang under the protection of the British flag. This being granted . . . a little subsidiary settlement soon sprang up. Being now for the first time secure from the attacks of the natives . . . they expected to pursue their occupation with far greater advantage to themselves.'

The Indonesian trepangers neither penetrated the mangrove fringe nor attempted permanent settlement in Australia before the European occupation. It is interesting to reflect that the exclusively white colonial enterprise in the Northern Territory is perhaps due to the activities of its Aboriginal inhabitants.

CHINESE CONTACTS?

Given the potentialities for Australian discovery, which people other than historically documented Macassans disembarked on its coast? The best claims for non-Europeans can be registered for the Chinese. Indeed, a zealous Chinese scholar has claimed that Confucius cited calculations in his *Spring and Autumn Annals*, based upon astronomical observations made during 592 BC and 553 BC by Chinese savants in Australia. He adds that sporadic contact was maintained during the following two thousand years. His views must be dismissed as fanciful reconstruction of vaguely phrased records or projections backward of astronomical data. There is somewhat more basis for his assertion that Chinese landed at Darwin in AD 1432, although the evidence is slight and the dating over-precise. Two levels of inference are involved in this problem, both of them intriguing, though tenuous invitations to future archaeological research.

In the first place, there are the seven famous voyages of eunuch Ch'eng Ho. Between 1405 and 1433 his huge fleet of junks made the Ming Dynasty known throughout Western Indonesia and

even in distant East Africa. Units of his fleet explored Timorese waters, less than 400 miles from Australia. It may not be unduly fanciful to suggest that Ch'eng Ho ordered exploration beyond Timor, or that his probing junks were blown off course and beached in Australia. It is also relevant that Chinese settled in Javanese seaports during the fourteenth century, while the stands of sandalwood in Timor's forests were known to them at least a century before Ch'eng Ho directed his junks there. Writing in 1613 of an earlier episode, Eredia reported that a Chinese junk from Macao, laden with Timorese sandalwood, was blown south of Timor. It reached a safe haven on an unknown island, which Eredia believed resembled Timor; it was not Australia, but there may have been other incidents when junks were buffeted by the winds to these shores.

Seemingly more tangible, but equally tenuous, are two stray material finds from northern Australia. A Chinese statuette discovered at Darwin and a porcelain potsherd from the Gulf of Carpentaria have been attributed to Ming craftsmen. Darwin was ten years old in 1879, when workmen under the direction of a government surveyor cleared land within a few hundred yards of the initial settlement. They recovered a small figurine of a seated rider, 'firmly wedged in between the roots' of a large banyan tree. It was four feet below ground surface and was caked with earth. The discovery was unrecorded until 1897, but it was not identified as Chinese until 1928. The only historical discussion of the object was delayed until 1951, when C. P. Fitzgerald examined it. Plate 14

It is an undoubted representation of the Taoist immortal, Shou Lao, the God of Longevity. Unfortunately the image is so ubiquitous that despite earlier opinions to the contrary, Fitzgerald believes that precise stylistic dating is impossible. He favours the age of Ch'eng Ho as the likeliest occasion for its deposition. From this general suggestion, the Chinese author mentioned above derives specific data. It was, he states, a sacri-

fietal offering made in 1432 by Ch'eng Ho in person, under the mistaken belief that he had reached the South Pole. It surely must be Darwin's only link with polar exploration.

A positive verdict on this evidence is impossible. The finder made no attempt to sensationalize or profit from his discovery, which remained unidentified, so he evidently was no hoaxer. It is disturbing to read that the labourers who found it were themselves Chinese, although Fitzgerald discounts the possibility of coolies owning such a fine piece. However, like other commentators, he states that the sculpture is rendered in jade, a material too valuable to be owned by a coolie. Expert examination has established subsequently that it was carved from soapstone. This attribution debases the value of the object, thereby undermining Fitzgerald's argument and raising the question of its ownership; it also poses the problem of its antiquity. Soapstone belongs to the talc group and is quite soft. It is doubtful whether it could have rested in the soil during four centuries and retained its sharpness of outline. In addition, inspection reveals it as a rather undistinguished production.

There are other possibilities. As Chinese were present in the Darwin settlement, perhaps it found its way beneath the banyan tree during the previous decade. Alternatively, perhaps it arrived on a Macassan prau, because the trepanging industry was controlled by Chinese merchants in Celebes. Counter to this suggestion is the negative detail that no Chinese are recorded as participating in trepanging expeditions and there is no positive evidence for trepanging in Port Darwin.

The Chinese porcelain sherd lacks stratigraphic credentials. It was found in 1948 lying on an open beach on Winchelsea Island, north-west of Groote Eylandt, without any traces of associated human occupation. The sherd was identified as typical Ming blue-and-white ware, dating from the late fifteenth or early sixteenth century, therefore post-dating Ch'eng Ho's voyages. Recent archaeological research in Arnhem Land has

demonstrated that Chinese and other mainland Asian ceramics followed an indirect route to Australia. Porcelain and stoneware of southern Asian origin occur on Macassan trepanging sites, and it must have formed part of their equipment; during the last century they frequented Winchelsea Island. While the antiquity of Macassan contact with Australia is undetermined, it may not extend back to Ming times, although the Chinese were trading with Macassar at that period. However, recent experience on the trepanging sites prompts questioning of the validity of the sherd's Ming date (or alternatively, perhaps the pot remained in use over a long period). What appear to be comparable porcelain fragments have been collected in contexts which must be more recent than Ming, some nineteenth-century. Further comment must await the detailed analyses of these finds. It is evident, however, that mainland Asian ceramics reached northern Australia in quantity, either incidentally through Macassan intermediaries, or directly through trade with nineteenth-century British colonial outposts. After the foundation of Darwin, it was introduced through the migration of Chinese. The task of sifting this evidence has barely commenced. Plate 10

ARAB TRADERS

When the Portuguese arrived in Island South-East Asia, they were not the first merchants or missionaries to have voyaged from the west. Moslem adventurers had established themselves in Malaysia and Sumatra during the fourteenth century and spread rapidly eastward. Portuguese chronicler Tomé Pires, writing around 1515, noted that 'Moorish merchants' preceded the Portuguese at the prosperous spice emporium of Banda, 500 miles north of Australia, by thirty years, and that Islam had come to the Moluccas earlier still. Pires acknowledged that he depended upon others for many details of these eastern seas: 'I have learnt from the Moors, from their charts, which I have seen many times.' When the Spanish navigator Torres sailed these same waters from the Pacific in 1606, he noted that the Moslem seafarers still plied their trade in the seaports.

Australia was deficient in the spices, gold, and bird plumage which made the Indies attractive to Arab merchants. It deterred Dutch traders for the same reasons, as the rueful comments of seventeenth-century Dutch skippers testify. Yet this Dutch knowledge resulted partly from voyages deliberately mounted for the specific purpose of inspecting Australia's commercial potential. As the Arabs were capable navigators, and as they visited islands as close to Australia as Aru, only 300 miles away, it would be surprising if curiosity, greed, or the whims of a monsoon did not bring them to Australia during the century and a half before the Dutch probed its coast. A further incentive may have been a desire to find fresh markets in the face of increasing European competition. Unfortunately, despite these attractive conjectures, there is no Australian evidence which can be adduced in their support.

The most frequent alien visitors to Australia must have been islanders from the arc of the Lesser Sunda group. Misadventure still brings seamen to Australian beaches, and hints of this situation are contained in nineteenth-century sources. The most tantalizing record dates from 1613, when Emanuel Godinho de Eredia composed his geographic description of the region. Eredia mentions various incidents when vessels sailed out to sea, southwards from Flores, Timor, Solor, Roti and other islands. Many of them reached fabulous lands abounding with gold which would do credit to Sinbad. But commentators have observed that time, distance or direction travelled could otherwise accord with a north-west Australian location for the land of Luca Antara; and believers may discern the Kimberley coast labelled as 'Java la Grande' on the sixteenth-century Dieppe maps. This vexatious problem has been expounded clearly by Andrew Sharp, who judges against the land being Australia.

THE TESTIMONY OF EREDIA

This evidence was tangible enough, however, to Eredia, who was officially sanctioned to explore south of Flores and Timor around 1600, in order to visit Luca Antara. Forlorn Eredia

apparently realized that the outbreak of a local war, which prevented him from sailing, cheated him of fame. Critics might dismiss the case, by treating it as gossip collected from quayside taverns, but Eredia is a persuasive writer. He was part-Macassan, and his examples of wayward voyages are Asian and not European. Likewise, his written records are of Asian origin. He referred obliquely to Javanese chronicles and to 'Lontares', perhaps a reference to palm-leaf manuscripts normally associated with Macassar. Such sources he claimed, testified to the extent of ancient commerce between the Indies and the rich southern land. Indeed, he was surprisingly precise with his chronology, if sparing with his documentation. According to 'poems, vulgar songs and histories', contact had been close until AD 1169, but wars had terminated trade and it was only renewed through an accidental voyage from Luca Antara to Java in 1600.

Eredia may have known precious records of Australian protohistory; it may be that the close analysis of Macassan palm-leaf documents may yet recover further clues. There is sufficient circumstantial evidence in his writings to hint that the historic Bugis trepangers possibly had ancient antecedents. If they had, archaeological evidence for it should be forthcoming in tropical latitudes. It is relevant to observe that Ronald and Catherine Berndt, anthropologists of Arnhem Land, believe that their interpretation of Aboriginal mythology requires a pre-Macassan alien contact phase, which they term Baijini.

During the sixteenth century, Portuguese merchants navigated the spice sea lanes. Historians discount their role in Australian discovery, partly because they assume incentives were lacking to draw them beyond spice and sandalwood harbours. But Pires in 1515 and Eredia a century later testify to an enthusiasm for the new commercial worlds and optimism for the prospects over the horizon. To Eredia and his contemporaries the lure of southerly gold beckoned, and surely such elaborate misinformation was incentive enough.

The Aborigines were a further inducement for Portuguese concern with Australia, at least in later times. George Windsor Earl, one of tropical Australia's most inquisitive colonists, visited Timor around 1840. Elderly Timorese recounted to him that Melville Island had been a major reservoir of slaves for Portuguese slave traders. P. P. King recounted that in 1818 a Melville Islander spoke two Portuguese words, or so he interpreted their tongue. Here was culture contact of a fundamental character, which may explain the savage treatment meted out by Melville Islanders to shipwrecked Macassans during historic times.

There is a material footnote to Portuguese voyaging south of Timor. Two brass cannons, one of them stamped with what has been claimed as a Portuguese rose, gun mark and crown, were
Plate 15 discovered on an island in Napier Broome Bay, in 1917, on Australia's Kimberley coast; another was found on a near-by reef two years later. The latter was unfortunately melted down for its brass, but the others are preserved at the Royal Australian Naval establishment at Garden Island, Sydney. They have been also claimed as possibly early-sixteenth-century pieces, made at Seville, Spain. It is therefore possible that this wreck pre-dated Dutch intervention in these waters, but systematic investigation of the antiquity of these cannons and some other less documented finds of Asian swivel-guns is merited.

DUTCH NAVIGATORS

Whether or not Portuguese speculation concerning golden lands in Australian latitudes attracted their craft to these waters, the Dutch seafarers who touched there were more pragmatic. Between 1606 and 1756 Dutch vessels navigated every coastline except the eastern seaboard, which was preserved for Captain Cook. As anthropologists they were undistinguished, although Jan Carstenz in 1623 and J. P. Peereboom in 1658 collected and described a variety of ethnographic implements. However, Abel Tasman failed to find more than the smoke of Aboriginal fires in Tasmania, while W. De Vlamingh, who spent six weeks in south-western Australian waters in 1696–97, only succeeded in

sighting Aborigines on two occasions during sixteen exploratory sorties into the hinterland. Lieutenant J. Gonzal was more successful in contacting natives in the Gulf of Carpentaria during 1756, when he plied them with arrack and sugar in order to kidnap two of them.

English buccaneer William Dampier, on the Kimberley coast in 1688, is famous for his anthropological dictum that the Aborigines were 'the miserablest people in the world'. But Carstenz anticipated him and voiced the opinion of most Dutch Captains when he judged the inhabitants of western Cape York 'the most wretched and poorest creatures that I have ever seen in my age or time'. Despite this lack of European interest in prehistoric Australians, and although these contacts proved worthless or even disastrous for the Dutch, the Aborigines must have benefitted. The exchange of liquor, glass and metal objects and the salvage from many shipwrecks enriched their economy. Indeed, anthropologists may have to reckon with the possibility that the light-skinned, mythological Baijini people originated as prosaic scouts for merchant princes.

These seventeenth-century shipwrecks on Australia's west coast have presented archaeologists with a frequently documented and attractive challenge in underwater archaeology. Perhaps unfortunately, scavengers and over-enthusiastic diving groups have located and sometimes disturbed such rich prizes as the *Batavia* (1629), the *Vergulde Draek* (1656) and the *Zuytdorp* (1712), in Houtman's Abrolhos or on the mainland. Recently, however, the Western Australian Museum took positive steps to co-ordinate activities and thereby ensure the systematic record and preservation of evidence from this unique marine graveyard.

HISTORICAL ARCHAEOLOGY

Another avenue of research into historic archaeology has been pioneered by F. J. Allen of the Australian National University. He is investigating the field evidence for British enterprise in tropical Australia. He has surveyed and excavated at the abandoned settlements of Fort Dundas on Melville Island (1824–29),

Plates 16, 17

Fort Wellington, Raffles Bay (1827–29) and Victoria, Port Essington (1838–49). In addition to permitting insight into colonial administrative and architectural practice and social conditions in an infant colony, this work has wider archaeological significance. Varied collections of European and Asian ceramics and glassware have resulted and their analysis should provide type collections of common wares for comparative dating on Macassan trepanging sites within Australia; and there are possibilities also for dating sites throughout south-eastern Asia.

A further problem of relevance to prehistorians is the culture contact situation. Both at Raffles Bay and at Port Essington, European relations with the Aborigines were intensive and amicable. The excavation of adjacent shell mounds has produced material evidence on the nature of this impact upon the native society. The most obvious intrusive element was the selection, trimming and use of bottle glass by societies who were poor in

Plate 8d

stone supplies and which hitherto utilized organic materials for many purposes.

Like its protohistoric record, Australia's brief historic phase has been characterized by many fleeting settlements which have left their archaeological imprint. The reasons are varied, but the consequences promise an interesting archaeological future. Abortive settlements, either due to human frailty or basic ignorance of the potentialities of a region, and changing settlement patterns accompanying social and economic development—such as penal era barracks, gold-rush shanty towns or the huts of pastoral pioneers whose stock denuded the area of vegetation—have left traces which are part of the Australian national heritage.

Landscape and People

On a first view we should be led to expect that this extensive tract of land possessed more than ordinary advantages; that its rivers would be in proportion to its size; and that it would abound in the richest productions of the intertropical and temperate regions. . . . But the very spot which had appeared to Captain Cook and Sir Joseph Banks an earthly paradise, was abandoned by the early settlers as unfit for occupation.

CAPTAIN CHARLES STURT, (1833, I: xii)

SUNDERED FROM Asia before Man inhabited the earth, Australia's 12,000 miles of coastline encloses a land mass (including Tasmania) of almost three million square miles, an area equal to the United States of America. When British colonists disembarked at Sydney Cove in 1788, Australia's Aboriginal migrants had occupied the continent for over 25,000 years, from a period contemporary with, or which possibly predated Man's penetration of the New World. Although the British government did not concede an Aboriginal title to the land, and was concerned more to forestall French or Dutch annexation, it enjoined humane relations with the Aborigines.

In keeping with his instructions and imbued with current notions of savage nobility, Governor Arthur Phillip's sympathetic approach was exemplified by his naming of Manly, a haven within Port Jackson, because of the 'confidence and manly behaviour' of its Aborigines. Phillip estimated the population of the areas which he visited within the first weeks of his administration to number about 1500 people.

Unfortunately, few other early observers provided population density estimates although several did write objectively about the Aborigines they encountered during journeys of exploration. Later, as the white man's security of land tenure tightened and as his sense of social superiority or 'burden' increased, most nineteenth-century observers lacked Phillip's genuine interest in

Aboriginal society or concern for its well-being. Consequently, potential demographic and ethnographic details went by default. The geographer J. R. McCulloch voiced mid-century opinion succinctly, and such sentiments do not beget objective field anthropologists: 'It would be a libel on Providence, to suppose that it was intended that this extensive portion of the earth should be forever occupied by a handful of savages.' In order to attempt a synthesis of the state of Aboriginal Australia at the time of European penetration it is necessary to rely on historic observations, ethnographic data and a modicum of archaeology.

A. R. Radcliffe-Brown estimated in 1930 that Australia's Aboriginal population in 1788 had numbered some 300,000; earlier informed opinion had conjectured half that figure, but his arithmetic has been accepted by later anthropologists. Whatever the real number—and it was possibly somewhat above Radcliffe-Brown's number, rather than below it—the density was low and the population was spread thinly over the continent. Some favourable environments permitted more concentrated occupation, notably on the northern and eastern coastal margins and the Murray River valley in South Australia. Queensland possibly supported almost a third of the entire population, particularly in coastal zones, while the arid third of the continent which received fewer than ten inches average annual rainfall numbered its inhabitants in hundreds. For example, the Aranda who occupied some of the better country in the interior probably totalled fewer than 2,000 souls, although their tribal territory covered 25,000 square miles. Further north, the Walbiri population of perhaps 1000 averaged one person per 35 square miles. R. M. Berndt estimated that only 18,000 people inhabited 250,000 square miles of the arid interior of South and Western Australia from the Great Australian Bight northwards to Capricorn. In some fertile coastal or riverine regions, however, population densities possibly were as high as one person to every three to eight square miles. Because of these variations in concentration, it is misleading

to average population over entire States, but assuming Radcliffe-Brown's estimates as reasonably informed, the number of square miles required to sustain one person ranged from 6.7 in Queensland to 38 in South Australia, while the continental average was 10. There are even fewer reliable clues concerning Tasmania's population, but the number is usually estimated around 4000. *Fig 3*

The Australian continent extends almost 2000 miles from Wilson's Promontory to Cape York and its maximum east–west dimension is 2400 miles. It is a land of plateau and plain, and unlike other continents its horizons are unrelieved by young fold-mountains. Indeed there is no true Alpine country with a permanent snow mantle, while only a few peaks in the south-east exceed 5000 feet. A belt of highlands curves around the eastern margin of the continent and on into Tasmania, but the proportion of land above 2000 feet is only seven per cent, less than in any other continent. On the other hand, nearly two-thirds of Australia consists of plateaux averaging between 1000 and 2000 feet in elevation, and this includes almost all its arid western portion. Two of the most congenial and important plains available for prehistoric occupation were the basalt region of western Victoria, one of the world's largest volcanic plains, and the great Murray-Darling river system which drains one-seventh of Australia. Prehistoric migrants may have taken advantage of the remarkable topographic feature which enables movement south from anywhere around the Gulf of Carpentaria, through western Queensland to the south coast, or inland to Lake Eyre, without crossing ranges higher than 700 feet above sea level.

RAINFALL

Yet if mountains imposed few barriers to prehistoric movement, water was a crucial determinant. With two-thirds of its land mass receiving fewer than twenty inches annual rainfall and fifty-five per cent experiencing desert or semi-desert conditions, Australia is the most arid continent. The fact that the highest relief fronts onto the moisture-laden winds from the Pacific explains the good rainfall on the eastern seaboard and the aridity

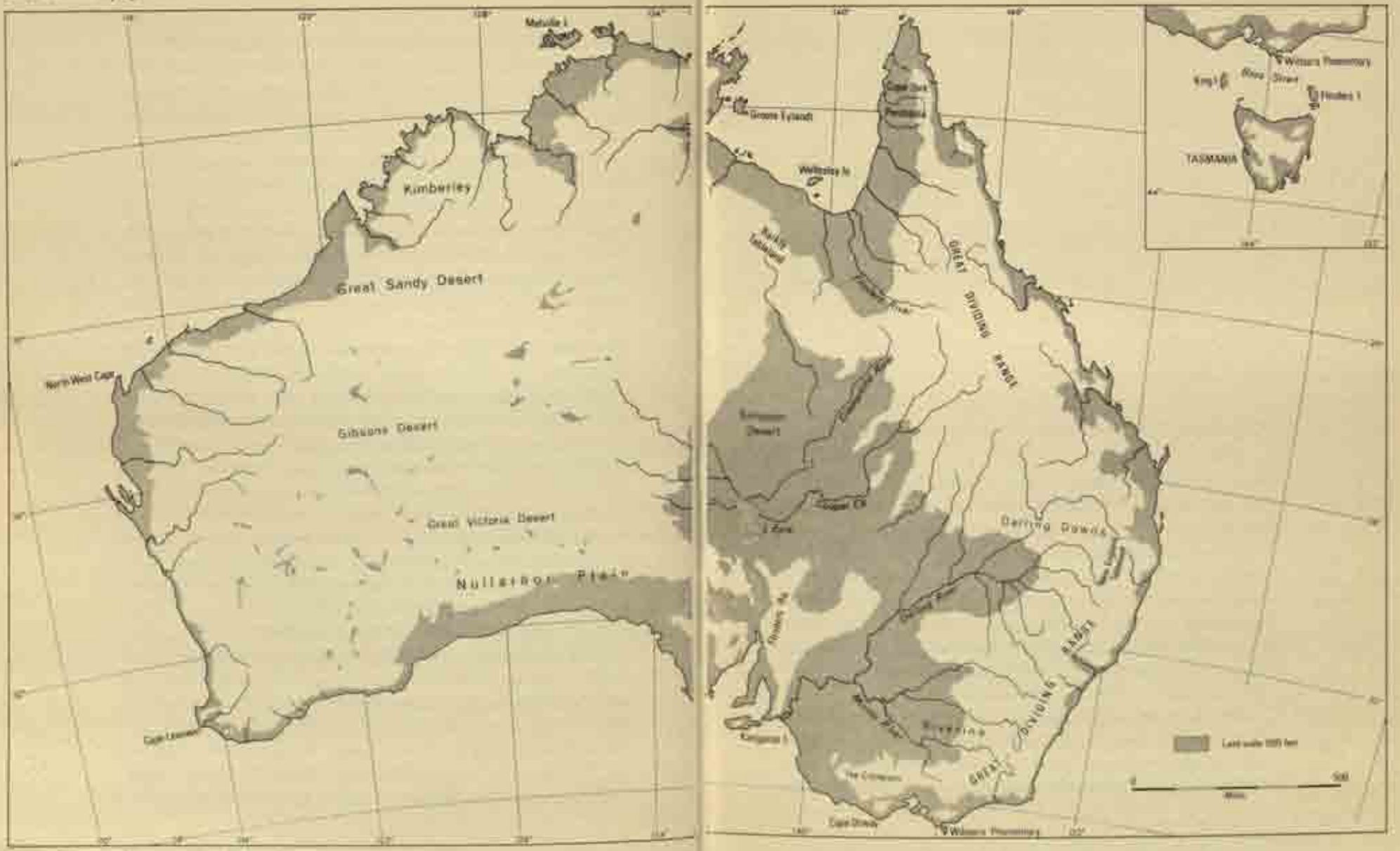


Fig. 3 The main drainage systems of Australia

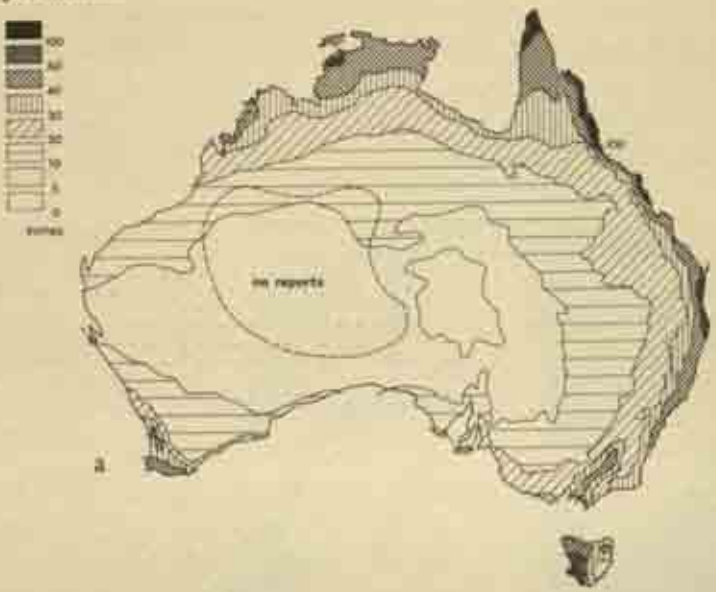
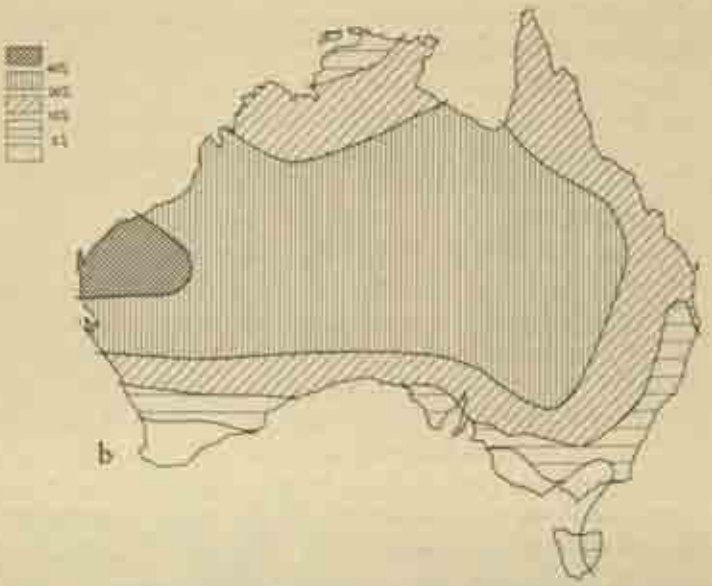


Fig. 4. Rainfall distribution: a, annual mean rainfall in inches; b, percentage mean

of much of the remainder. But in a land where evaporation is high (and immense tracts experience above-century temperatures) it is seasonal reliability or variability of rainfall and not its average, which is the true gauge to the ecological situation. For example, Roebourne on the west coast received 42 inches of rainfall in 1900, but only 0·13 inches in 1891; Alice Springs has recorded annual falls ranging from little more than an inch to 40 inches. Even within the tropics, the 'wet' season is very variable in the extent of its wetness, while the long 'dry' season parches the hinterland and most rivers are intermittent. *Fig. 4*

Even the rivers which flow from the eastern mountains are more variable in their discharge than the world average. Actually, only a third of the entire Murray-Darling drainage system contributes water to the trunkstream, the Murray, and even this



variability from annual mean rainfall (Adapted from C.S.I.R.O. 1960, Figs. 16 and 17)

1600-mile river which rises in the highest mountains has more than once ceased to flow. The Darling, Australia's longest river (1750 miles), is sometimes dry, and when flowing, its contribution to the Murray has varied from 1000 to 11,000,000 acre-feet per annum.

The Australian landscape is dotted with lakes, but maps are deceptive because the majority are simply dry clay pans (*playas* and *salinas*) fed intermittently through ill-defined channels. The largest of them, Lake Eyre, receives an average rainfall of five inches. However, the Lake Eyre Basin of 1,300,000 sq. km. possesses a drainage pattern whose tributary channels occasionally flood. Yet, for most of the past century its long feeder rivers, which meander from Queensland, have remained dry, or at the most have permanent or semi-permanent water holes strung along their

beds. In this, they resemble many of the intermittent streams which drain the northern monsoonal belt.

VEGETATION

Australia has become hackneyed in verse as the land of wattle and gum trees. There are indeed about 630 species and varieties of *Acacia* (wattle) and at least 603 eucalypts have been identified, which range in size from stunted scrub to stands of mountain ash (*Eucalyptus regnans*) and karri (*E. diversicolor*) over 200 feet tall. Consequently, there are varieties appropriate to every habitat and in addition, the other flora is remarkably diversified. To what extent Aboriginal activities cleared the land previous to European settlement is a matter which future research must clarify. Basically, however, Australia was well vegetated in 1788. The explorer Charles Sturt spoke for all settlers when he observed that 'he who has never looked on any other than the well-cultured fields of England, can have little idea of a country that nature has covered with an interminable forest.' As late as 1869, despite pastoral expansion and gold rushes, Victoria was estimated to have natural forest or scrub covering 85 per cent of the State. Even those areas which are designated 'desert' on maps support vegetation, including the unique parallel sand ridges and interdunal corridors of Simpson's Desert which stretch for miles in Central Australia. Because of the high evaporation and seasonal dryness, bush fires are a scourge of forest and grassland alike, and although Aborigines from Arnhem Land to Tasmania burnt their surroundings to an extent greater than that generally appreciated, this destruction was intensified by European colonists.

Fig. 5

To judge from numerous recollections of early European settlers, the advent of stock and systematic burning had drastic ecological effects, and these must be taken into consideration when reconstructing the 1788 landscape. Pastoral occupation upset the delicate balance of nature through over-grazing and the destruction of grasslands and forests which provided many edible seeds and roots and supported a rich fauna; erosion also followed. In western Victoria, brush and useless timber grew thickly in areas

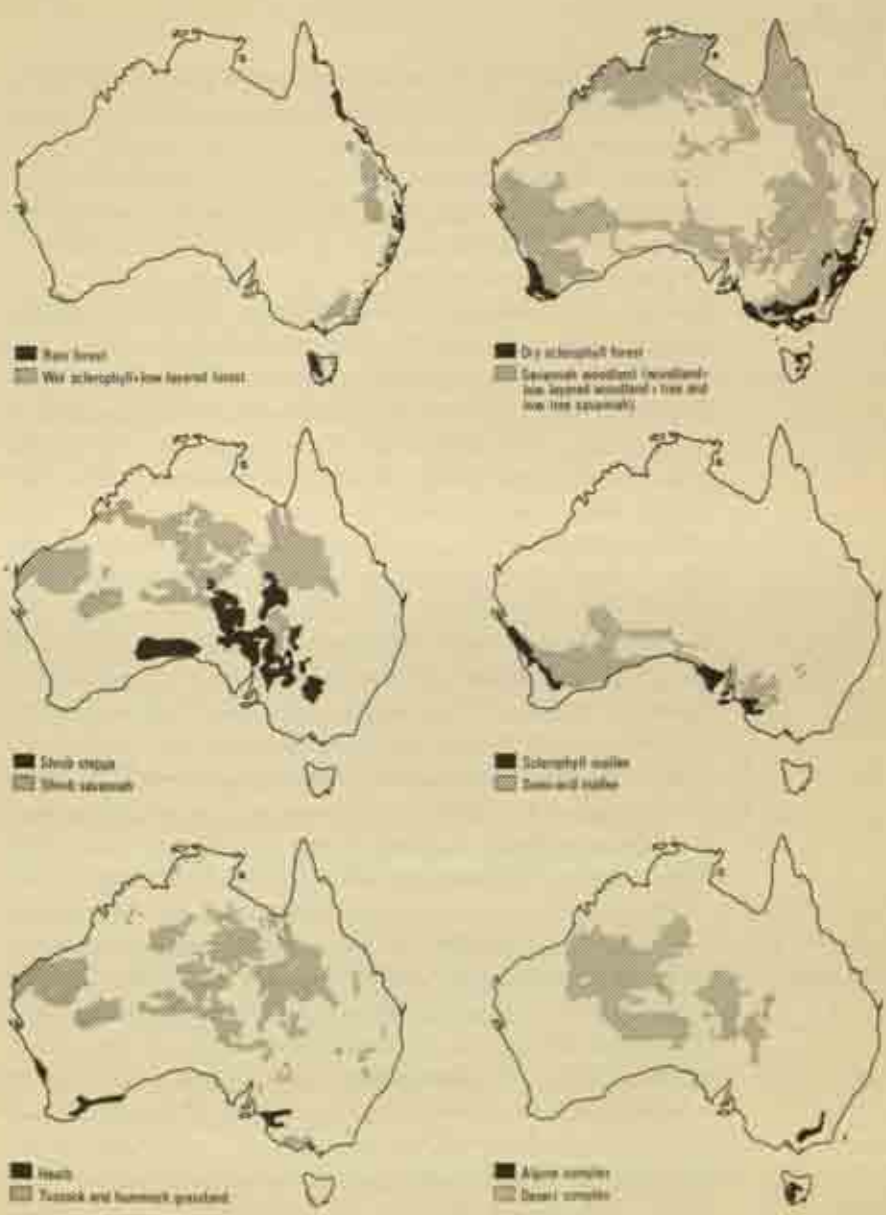


Fig. 5. Generalised vegetation distribution in Australia (Adapted from C.S.I.R.O. 1960, Fig. 23)

of former open woodland; even in 1900 it was possible to gallop a horse near Aboriginal art sites in the Grampian mountains where today the brush is almost impassable. In the tropics at Port Essington, the commandant of the settlement noted that within a few years of its foundation, cattle were becoming lost in the dense brush which had sprouted in the open schlerophyll woodland. In arid areas, where erosion was so marked, another factor operated. After a few good seasons grazing on slowly regenerating native grasses, stock fouled and trampled shallow water-holes, and by destroying the surrounding vegetation, they ensured their elimination through evaporation and erosion. Anthropological pioneers, Spencer and Gillen, visited many shady pools in the 1890's because they were frequented by Aborigines; a few years later they were desert.

It is evident, therefore, that pre-European landscapes were more congenial to the Aborigines. With many areas better grassed, they were easier to traverse because natural water-holes were more frequent and consequently edible plants, insects and game were in better supply. But generalizations are impossible. Australia embraces such major vegetational associations as tropical and temperate rain forest, wet and dry schlerophyll forest, woodlands and savannahs and the extremes of both desert and Alpine complexes. It is trite but necessary to observe that Aboriginal economy and technology was adapted to the flora and dependent fauna within each vegetational habitat.

ABORIGINAL MAN AND THE LAND

'Drought', with its associations of water shortage, searing heat, winds and fires, is possibly the worst natural calamity known to white Australians, and 'weather' is certainly their most ubiquitous conversational gambit. It also must have regulated Aboriginal society. T. G. H. Strehlow comprehended its significance for life in arid areas. He estimated that during drought conditions, as much as seven-eighths of the 'tribal' area in Central Australia would be evacuated, while the people retreated to permanent watering-places. Aborigines also ex-

ploited the incendiary potential by burning tracts of country as a hunting device or to promote the growth of next season's edible shoots, or to clear tracks through tall grass or forests. Tasmanian Aborigines were seen to burn rain forest, even while rain was falling, and thereby kept trackways open through areas now virtually impenetrable. The transformation of the red landscape of Central Australia after rains, when a profusion of green grass, wildflowers and innumerable edible plants flourish for a brief season, is remarkable. Strehlow has claimed that it was the challenge of the climatic unpredictability, with its whimsical bounty and famine, which explains the richness of Aboriginal ceremonial and mythological life, the rigidity of their social controls and their intimate knowledge and attachment to their land. Like Arnold Toynbee, Strehlow interprets such human responses as more than mere economic determinism. 'It is a tribute to . . . intelligence', he writes, 'that they were able to subsist without outside help, and without man-made changes, on the natural resources.'

Tindale wryly commented that the Ancestral Beings who 'created' natural resources during the 'Dream-time' protected these resources from over-exploitation by developing systems of taboo, enforcing dietary restrictions on social groups and age grades. This creation mythology embodied empirical wisdom, gained from trial and error, intended to ensure survival and endowing tribal territories with an organic relationship with their owners.

The fact remains, however, that in a nomadic hunting society, it is the leanest season which is the true gauge of the capacity of a country to sustain a population. So it was also that many early explorers were misled while traversing territory during the wet season or after abnormal rains. Their accurate, yet misleading, reports tempted cattlemen and sheep-masters to de-pasture their herds or flocks in areas totally unsuited to intensive grazing. Nature soon depopulated the region of stock, down to its actual

carrying capacity. It may be suggested likewise that the Aboriginal population in 1788 had achieved ecological equilibrium. It is probable that the first Aboriginal immigrants multiplied rapidly with the presumed favourable conditions in Pleistocene Australia, but it is interesting to reflect that the optimum population level was possibly attained long before the Europeans arrived. Indeed, the surface distribution of stone artifacts is so dense in arid areas such as the Lake Eyre Basin and the Flinders Ranges, that it seems probable that these regions supported a larger prehistoric population than that occupying them during European contact times.

J. B. Birdsell argued cogently that population saturation was attained rapidly, probably before the end of the Pleistocene epoch. Although his estimates may prove unduly optimistic—his various models of gene flow and population dynamics are necessarily hypothetical, while his data collected in 1938 may not typify the prehistoric demographic situation—their perspective is stimulating. Birdsell concluded that an average Aboriginal generation spanned only sixteen years; his favoured model assumed that twenty-five initial colonists increased to almost 300,000 within 2204 years; their diffusion across Australia required merely a few centuries.

If indeed the continent had been effectively occupied during the Pleistocene, and optimum exploitation of resources achieved within technological limits, this demographic status quo, involving hundreds of generations, might explain Australia's sharp tribal and linguistic differentiation. Such a rapid dispersal would have relevance to a phenomenon outlined below—a similarity in stone implement typology on 'early man' sites throughout the continent.

RACIAL AFFILIATIONS

While no one either claims an Australian genesis for the Aborigines or disputes their derivation through South-East Asia, it remains an open question whether they constituted a single race or an amalgam of different stock; despite positive

statements to the contrary, close affiliation with sundry living Asiatic groups is more visually apparent than demonstrably real. By 1870, when T. H. Huxley published his racial systematisation, most theorists agreed that mainland Aborigines were one uniform racial type, and that Tasmanians were another. Although details and emphases have changed, this pattern has gained acceptance by many physical anthropologists over the century; A. A. Abbie recently reiterated their case—Aborigines 'are an exceptionally homogeneous people'.

In the field in 1938, however, Birdsell was struck by their heterogeneity, and proposed a tri-hybrid racial composition, involving three migrations during Pleistocene times. It is unfortunate that basic supporting evidence for his challenging interpretation, formulated in 1949, was not forthcoming until 1967, when he published some 'preliminary data'; misgivings of some critics might have been allayed sooner. Birdsell envisages the first wave, referred to as Oceanic Negritoids, Tasmanoids or Barrineans (after a lake on the Atherton Tableland, Cape York), as typified today in purest racial form by the Andaman Islanders. The second migrant group, Murrayians, hirsute derivatives from archaic Caucasoid stock (compare the Ainu), absorbed the Oceanic Negritoids, except in isolated rain forest fastnesses (as the Atherton Tableland) and Tasmania (although hybridisation did occur). The final infusion, Carpentarian or Australoid, (racially analagous with Veddas in Ceylon, and Deccan and Malayan hill peoples), never penetrated beyond tropical latitudes.

Superficial familiarity with Aborigines indicates considerable regional variation in stature, build, pigmentation, hairiness and hair texture, nasal and cranial profile and other physically diagnostic attributes, and Birdsell examined these factors exhaustively. Critics claim that such variations are not fundamental, but may be explained by reference to ecological and environmental pressures—climate, diet, geographic isolation of small breeding communities—or human factors, such as strin-

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gently prescribed tribal mating patterns, or unique selective events such as war or natural disaster. Birdsell was aware of such limitations, and emphasised in addition those human characters which are not subject to environmental modification, but are inherited and genetically determined, such as blood group systems. In 1949, he was sanguine that blood group genetics 'tend to fit into and substantiate the racial analysis presented'.

GENETIC INDICATORS

Intervening years have witnessed tremendous growth in genetical research in techniques unavailable to Birdsell, with resulting complexity rather than clarification. R. T. Simmons, in later reviews of Aboriginal blood group gene frequencies, was neither able to confirm nor deny the possibility of tri-hybrid racial origins. R. L. Kirk's recent survey of advances in serological, blood serum, dermatoglyphic and other genetic marker research, concluded that Aborigines constitute a genetically distinct group, although possessing significant internal variations. Current gaps in knowledge are so great, that he judged 'theoretical generalisations can be . . . only of the most general kind and must remain insecure whilst these gaps exist.'

Birdsell admits that there is no Asian or Australasian archaeological evidence documenting the passage of Negritos; his inferences depend upon the distribution of living communities. Yet affinity between these disparate groups is difficult to establish. Indeed, the Tasmanians are excluded from genetical research by reason of their extinction. To some, the ethnic identity of the Barrineans of Cape York is rendered dubious by recent genetical studies elsewhere. The mountainous Wissel Lakes region of West Irian is inhabited by diminutive Negritoid tribes. Investigation proved that their blood group gene frequencies were indistinguishable from those of neighbouring Papuan people. As their language and material culture are also comparable, it is difficult to assess objectively their distinctive features, and differences in stature and other physical aspects are interpreted as incidental environmental characteristics. A comparison of gene

frequencies between these people and other Oceanic Negritoid groups in Malaysia, the Philippines and the Andaman Islands demonstrated their difference from each other, yet their similarity with those of surrounding peoples of normal stature.

Australia's Western Desert Aborigines are of intense biological interest. Kirk demonstrated the uniqueness of genetic marker patterns possessed by this relatively small and isolated reproductive group in its harsh environment, where factors involving selection, inbreeding and genetic drift may be relevant. In this context, the isolation and comparative environmental rigours of Tasmanians and rain forest Barrineans also may possess genetic significance. In Australia, the need is for genetic research on the living people, combined with archaeological discoveries of the fossil human record. A century after T. H. Huxley, it remains premature to pronounce for racial heterogeneity or homogeneity.

TRIBAL ORGANIZATION

In 1788, this population was divided into groups which Europeans termed tribes. Because so many tribal units disintegrated rapidly, the actual number is largely a matter of definition. The number has been placed as high as 900, although about 500 is the usual estimate. Ideally, a tribe is a social group which claims hunting rights and religious sanction for its occupation of an area; its boundaries are loosely defined usually by reference to natural features which have mythological significance; its members assume that they are in some manner distinctive, through actual or implied genealogical relationship, obedience to common behavioural rules and the use of a common language or dialect. But it is not a 'nation' or 'confederation', for there is no political cohesion between its constituent groups and there is no paramount or tribal chief or tribal council.

It is more significant for the potential archaeological record to understand, however, that tribes were divided variously into smaller social units and that the whole of their members rarely, if ever, assembled as an entity. For example, the family (often not

monogamous) was a basic and self-sufficient economic unit with a rigid division of labour based on sex, which often functioned independently of other families. More commonly, particularly in congenial environments, several related families associated and ranged within understood territorial limits. In this organisation, the men often hunted as a party while the women foraged as another. Such a cluster of families, perhaps numbering from 20 to 50 persons and in favoured regions even more, represented a normal-sized encampment, but the number varied with fluctuations in subsistence conditions. Stanner has suggested that throughout the enormous variety of habitats, the continent may have supported from 5000 to 10,000 territorial groups of this nature. These are the communities, therefore, whose material traces the archaeologist usually uncovers. Yet in confined, stratified archaeological contexts, such small numbers multiply. It would have required annual visits by a group of twenty people to Kenniff cave, occupied for some sixteen millennia, to total over 300,000 occupants.

When very localised or seasonally abundant food or water supplies were available, or when ceremonial obligations demanded, these local groups congregated, perhaps in groups of 100 to 300, whereas in leaner times they scattered. In almost every habitat for which there is evidence this clustering and dispersal typifies the polarity in the Aboriginal life-pattern in all but exceptionally provident areas. It is also a factor of which any archaeological interpretation of occupational evidence must take account. Donald Thomson demonstrated the potential archaeological pitfalls in his classic survey of the ecological and seasonal ramifications of Cape York nomadism. His exposition of foods and implements used in an annual cycle conveys a warning that an archaeologist who was unaware that these were seasonal camps occupied by the one group of people would conclude from his analysis of the material that it represented refuse from different groups ('cultures').

There are examples, particularly from the south-east, which indicate that planned exploitation of seasonal abundance enabled assemblies of several hundred people. On the Murray River, freshwater crayfish in springtime or netted fish in summer supported such numbers, while in the Alpine High Plains area, swarms of nutritious *bogong* moths attracted Aborigines from all directions; a European estimated that 500 congregated for the feast. Some other recorded congregations resulted from fortuitous unpredictable bounties, such as the carcase of a stranded whale or the profusion of growth following torrential rains in arid areas. However, other assemblies which must have been adjusted to well-founded environmental knowledge were less transient and are of considerable archaeological interest. These were congregations where the ceremonial exchange of goods led to their wide dispersal. The significance of such contacts is discussed separately, but it is appropriate here to cite a striking example from Western Victoria. The places mentioned by James Dawson indicate that peoples inhabiting perhaps 5000 square miles of good country were represented at the gathering.

> At the periodical great meetings trading is carried on by the exchange of articles peculiar to distant parts of the country. A favourite place of meeting for the purpose of barter is a hill called Noorat, near Terang. In that locality the forest kangaroos are plentiful, and the skins of the young ones found there are considered superior to all others for making rugs. The Aborigines from the Geelong district bring the best stones for making axes, and a kind of wattle gum celebrated for its adhesiveness. This Geelong gum is so useful in fixing the handles of stone axes and the splinters of flint in spears, and for cementing the joints of bark buckets, that it is carried in large lumps all over the Western District. Greenstone for axes is obtained also from a quarry on Spring Creek, near Goodwood; and sandstone for grinding them is got from the salt creek near Lake Boloke. Obsidian or

> volcanic glass, for scraping and polishing weapons, is found near Dunkeld. The Wimmera country supplies the mallee saplings, found in the mallee scrub, for making spears. The Cape Otway forest supplies the wood for the bundit spears, and the grass-tree stalk for forming the butt piece of the light spear, and for producing fire; also a red clay, found on the sea coast, which is used as a paint, being first burned and then mixed with water, and lain on with a brush formed of the cone of the banksia while in flower by cutting off its long stamens and pestils. Marine shells . . . and freshwater mussel shells, are also articles of exchange.

Traditionally, it has been assumed that there were almost as many distinct languages as tribal divisions; and to some anthropologists 'tribe' and 'language' have been synonymous. Intensive linguistic fieldwork and genetic classification have forced a reappraisal of the philological pattern, and Aboriginal linguistics now offers an attractive research field.

LINGUISTICS

While it is evident that fewer than one per cent of Australian languages are unrelated to others, at least 85 per cent of them are closely interrelated and constitute a phylum of a single linguistic stock. They share many morphological and other structural features including a similar phonetic basis and agreements in a small basic vocabulary.

The crux of the re-evaluation is that lexical comparison of the 700 different forms of speech in Australia establishes the prevalence of 'dialect chains'. For example, linguistic groups A and B may be mutually intelligible, A and C partly so, while A and D are mutually unintelligible despite the fact that groups C and D can converse. Therefore, despite Aboriginal affirmations that tribal languages are unique, the fact that neighbour intelligibility is so prevalent makes it probable that an entire dialect chain should be classed as a single language. For this situation, the less positive term 'family-like language' has been coined. Depending upon

where the linguist breaks the links in dialect chains, the total number of Australian languages varies from between 150 and 300, with 220 as the current optimum estimate.

Many attempts have been made to connect Australian languages with speech overseas. A link with the Dravidian language of India has been assumed for over a century, but this is wishful thinking. In his comprehensive survey, Capell has emphasised the 'complete failure to link Australian languages with any other family'. In his opinion also, the number and differentiation of Australian languages required many millennia of local isolation for their indigenous development.

Linguistic research therefore has interesting implications for prehistoric studies. The evidence of language distribution necessitates great antiquity and isolation for Aboriginal peoples. It may be inferred also that, subsequent to their dispersion, regions of the continent were isolated while 'family-like' languages developed. Conversely, and despite plausible speculation by earlier writers, Aboriginal linguistics cannot substantiate Asian origins or migration routes.

By 1788 the Aborigines had colonised the continent and they lived in ecological adjustment with their many environments. It was a sunburnt landscape, but although its rivers ran dry and Europeans judged it a harsh continent, to the Aborigines it appeared congenial and they identified themselves more intimately with their tribal estates than did any contemporary patriotic European with his nation state.

It must be emphasised that neither Aboriginal culture nor habitat remained static. When the ancestral Aboriginal migrants resumed Man's eastward expansion beyond the Asiatic shore of Wallacea, the ocean deep which formed a permanent barrier throughout the Quaternary to migrations of flora, fauna, and men lacking water craft, these Pleistocene explorers traversed a vastly different continent from that explored by Europeans perhaps 300 centuries later.

PLEISTOCENE ENVIRONMENTS

In the first place, it was larger. During the last glaciation, sea-level dropped over 350 feet below its present level; even 15,000 years ago it was perhaps 250 feet lower, only attaining its modern level between 6000 and 3600 years ago. On these figures, Australia has been severed from Tasmania for 11,000 years and less than 8000 years from New Guinea. The emerged Sahul Shelf would have obliterated the Gulf of Carpentaria, linking Queensland to the Aru Islands and adding perhaps a tenth to Australia's area. These extensive northern plains, drained by prolongations of such river systems as the Flinders, Roper and Victoria, should have facilitated migration and enabled mountainous areas like New Guinea to be skirted.

Australia was closer to Asia, and migrants had fewer sea-miles to negotiate, although the narrowest gap must have been more than 50 miles, further than island-hopping within visual range. Whether the initial Australian landfall was a chance discovery or the result of planned voyaging does not alter the fact that Man required seaworthy water-craft and a capacity to cross empty sea-horizons; the actual length of the passage is incidental to the basic possession of craft. This revised map requires re-orientation. A route from Malaysia, through Java and Timor looks the most direct on the modern map, but during the Pleistocene, wide ocean still separated Australia from Timor. A practical route lay further north, possibly from south China, through Taiwan, the Philippines and Borneo to the Celebes, and thence south of New Guinea to Arnhem Land or Cape York.

Climatic conditions were different. Whereas earlier workers generalised about Pleistocene environments on *a priori* grounds, this is now difficult. Concepts are fluid today, because it is realised that Australian evidence is both meagre and contradictory; no grand synthesis is possible until detailed regional studies are concluded. My own views conflict with my earlier published opinion. It is agreed that Australia's ice mantle was insignificant —perhaps twenty square miles in the major Alpine glacier field

and about one fifth of Tasmania at the glacial maximum—but temperatures were lower, and most importantly, evaporation was reduced; some claim that it was wetter, others that precipitation decreased under cold, windy conditions.

WIND SYSTEMS

For many years, the geographer Griffith Taylor set the accepted pattern, with his attractive theory of a major northern latitudinal shift of the cyclonic belt ('the roaring forties') thereby displacing the drying anticyclonic wind system, and bringing rain to the continental mass, resulting in the formation of immense lakes and brimming rivers in the arid centre. This interpretation still has many adherents and J. Gentilli recently presented a modified version. It is likely, however, that much of Taylor's evidence related to Tertiary conditions, irrelevant to the later Pleistocene advent of Man. Recent arid-region research indicates that many sand deserts are mainly a legacy of this great Tertiary alluviation, and that dunes formed on these older flood plains under windy conditions, for which there is evidence in the Lake Eyre Basin from 40,000 to 20,000 years ago. Immense homogeneous and stabilised dune systems in the heart of the continent and on intertidal reaches on the north-west coast, are evidently of Pleistocene origin. Significantly, their orientation conforms to the present anticyclonic pressure system, and the trend of longitudinal ridges accords closely with prevailing winds across twenty degrees of latitude.

P. J. Darlington produced biogeographical data to support the thesis of Pleistocene aridity. Two genera of flightless, forest-living carabid beetles inhabit south-western and eastern forests, yet their representatives are very distinct species. Darlington infers that they were Tertiary relicts, and that throughout the Pleistocene southern Australia was insufficiently watered to allow the growth of a continuous belt of moderately wet forest across the continent.

Even in the south-eastern Alps, the distribution of glacial cirques implies that snow-bearing winds blew from the same

direction as the present weather system, again indicating similar circulation patterns. Therefore, some recent workers envisage stable circulation belts, and rather than invoke major pluvial weather migrations, they believe aridity may have increased beyond present bounds. The pedologist B. E. Butler explains the Pleistocene formation of the deep riverine plains of western New South Wales as consequent upon increased aridity and declining vegetation cover, producing erosion and rivers incapable of transporting their alluvial load. His interpretation is challenged by G. H. Dury, who explains the sedimentation as essentially a pluvial phenomenon. The resolution of this problem is attracting considerable research interest. Its relevance to archaeology is great, because human occupation might be anticipated to concentrate along the banks of the 'prior streams' (ancient infilled watercourses) which drained it, but which produce palimpsests upon air photographs of the immense plains.

Rather than continental-wide wet and cool conditions, R. W. Galloway predicates a cold, dry, and windy spell. The crux of his forecast is that lower temperatures and markedly reduced evaporation explain high water levels in inland lakes, rather than increased rainfall. While earlier climatic interpretations require reconsideration, the debate remains open, because there are other instances of Pleistocene dune formation, in south-eastern South Australia and at Lake Menindee, where according to Tedford, pronounced shifts in prevailing winds seem indicated.

POST-GLACIAL CLIMATES

There is further conflict of opinion concerning post-glacial climatic changes. In step with earlier assumptions about a climatic optimum overseas, evidence has been adduced for a temperature rise combined with intense aridity around 6000 to 4000 years ago (the Great Arid Period). Recently, considerable variety of opinion on its overseas extent and interpretation was expressed at the London conference, 'World Climate From 8000 to 0 B.C.'; comparable misgivings exist concerning the Australian Arid Period. On the negative side, no specific

evidence has been forthcoming from archaeological excavations, but that may result only from their rarity. Doubts are most evident in botanical research, where hitherto it became accepted that in the absence of basic botanical data, climatic changes might be inferred from other disciplines; these conclusions were then used to explain some plant distribution problems. Donald Walker has exposed the fallacy of this circular approach—there is no botanical evidence 'which demands explanation in climatic terms and which can be related to a well-documented chronology'. Tasmanian botanists point to man and not nature, as the agent of change.

Indeed, Australian evidence can be selected to support conflicting interpretations of post-glacial climatic phenomena, simply because field research is restricted and different specialist investigations have not been synthesised. The evidence of higher sea-levels on the Western Australian coast contributes vital data for the theory of an eustatic rise of three metres; yet on supposedly equally stable eastern beaches, no such shore lines occur. Dune formation in Victoria's fertile Western District is cited as proof of dry lakes and dust-storms during the Arid Period; yet one (undated) series of lunettes developed while its related lake was full. Wind patterns possibly remained constant in the Alpine region; in the Western District prevailing winds blew from another quarter. Western Victorian evidence figures prominently in discussions, but whether it was a typical region seems open to question, as, unlike the rest of Australia, it witnessed considerable volcanic activity from late Pleistocene times to less than 5000 years ago; and Hails questions the stability of the south-eastern coastline. The Arid Period has been advanced as a plausible explanation for the extinction of giant marsupials; apparently this fauna was already extinct.

EXTINCT FAUNA

Indeed, one of the most important differences between Australia in 1788, and at the time of its first settlement, was its fauna. Pleistocene Australia supported a diversified and primarily

herbivorous giant marsupial and avifauna which had proliferated during late Tertiary times. Earlier opinion was that their extinction antedated Man, although its date and cause was obscure. Because of their bulk—*Diprotodon* was the size of rhinoceros; another quadruped, *Nototherium* was bullock-proportioned; Macropodids (kangaroos) dwarfed modern species; flightless birds, *Genyornis* and *Dromornis*, matched some Moa—it was deduced that inland plains were luxuriantly grassed, and that extinction followed climatically determined desiccation of their pastures. During the later Pleistocene, extinction came to two entire marsupial families (Thylacoleontidae and Diprotodontidae), at least twenty genera and numerous species.

Recent research demonstrates that the Aborigines were these creatures' contemporaries, although no definite 'kill site' has been found. These ancestral settlers indeed discovered pastures new. After the jungles of tropical Asia, with its attendant carnivorous fauna, the inland plains posed contrasts and challenges. Only one substantial presumed carnivore competed for the same herbivorous game—*Thylacoleo carnifex*, the leopard-sized marsupial 'lion'; *Thylacinus*, the marsupial wolf was dog-sized. Other marsupials bulked large but were comparatively harmless.

The most important sites investigated so far centre upon Lake Menindee, where bones of twelve extinct giant marsupial species were recovered in presumed human association. These included *Diprotodon*, *Thylacoleo carnifex*, and the large macropodids (kangaroos)—*Procoptodon*, *Sthenurus*, *Protemnodon* and *Propleopus*; the horizon from which most came is dated, alternatively, 18,800± 800 or 26,300± 1500 B.P.

At Keilor, Dr A. Gallus excavated a similar, but less comprehensive assemblage in a context dated around 31,000 years ago, but its association with Man remains to be authenticated. D. Merrilees recently surveyed the faunal evidence from caves in south-western Australia. The remains are varied and late Pleistocene in age; but hints of Man's presence require archaeo-

logical substantiation—obviously an important project. Edmund D. Gill analysed a fossil fauna collection made last century at Lake Colungulac, western Victoria. An age for associated Coxiella shells is 13,700± 250 BP (Y-170). Some workers prefer to place this evidence in a suspense account, because a single radiocarbon date on freshwater shells could be misleading.

Recent radiocarbon research on shell, carbonate and bone poses difficulties for other dated samples. The most recent date, 11,100± 130 BP (N.Z.-381), is for dentine from a *Diprotodon* molar, at Orroroo, in South Australia's Flinders Range. Possibly this is misleading. It is relevant that an even younger dentine estimation, from Lake Callabonna, has been rejected as contaminated by younger carbonate-enriched groundwater; a 6500 BP sample from Lake Menindee also proved unreliable. At the other end of the scale, estimations greater than 37,000 years have been obtained for the fauna in Tasmania, Western Australia and Lake Callabonna.

The fact that these massive beasts mired in Lake Callabonna perhaps 40,000 years ago, presumably in drying swamps, serves as warning against a simplistic explanation of their extinction perhaps twenty-five millennia later, as caused by the onset of aridity. It is relevant that they inhabited glacial Tasmania at the same time, and surely, if aridity exterminated them in the Centre, this factor cannot have operated in Tasmania. Whatever the causes of the great extinction, they must be applicable to all regions, and explain why no relict communities survived.

Previous thinking has been conditioned both by the belief in lush hinterland pastures and by the knowledge of present restricted habitats of certain marsupial species. Galloway's meteorological re-interpretation implies that vegetation of giant marsupial times may have been sparser, and conditions less congenial than conjectured. Crop contents from *Diprotodon* at Lake Callabonna were similar to its contemporary saltbush vegetation, and Merrilees suggests that shrubby plants were its normal diet. (Australia's

largest living marsupial, *Macropus giganteus* (grey kangaroo) lives in semi-arid regions.) The fact that the extinct fauna thrived in areas as diverse as Callabonna, Tasmania and south-west Australia indicates considerable adaptability; and research is proving that within recent times smaller marsupials were more tolerant geographically than was hitherto believed.

The Tasmanian Devil (*Sarcophilus harrisii*) is a good example. Now restricted to Tasmania, a few hundred years ago it inhabited Victoria, while remains occur in Recent and Pleistocene contexts throughout southern Australia, including the barren Nullarbor Plain. The excavation of a 3000-year-old specimen in Padypadly rock shelter, near Oenpelli, extends its range into the tropics, 1400 miles from its nearest recorded occurrence. Another species, now known to have a wide and Recent southern continental distribution, is the Tasmanian marsupial wolf (*Thylacinus*).

MAN AND SPECIES EXTINCTION

In the case of such smaller marsupials, their chronological and geographical range is so great that climatic factors cannot have caused their regional extinction. It seems possible that it was Man, not Nature, who confined their distribution. It is premature to conclude that Man also exterminated the giant marsupials, although both Merrilees and Jones recently advanced cogent arguments for concentrating upon this line of research. I am convinced of its significance, although it conflicts with my earlier opinions.

Three factors are relevant to Man's advent. The first concerns possible selective hunting techniques of favoured food animals, or slower species. Perhaps more important were the consequences of Man's accidental or deliberate firing of the vegetation. Gilbert and Jackson assembled convincing evidence indicating that extensive tracts of Tasmanian vegetation were transformed anthropogenically, where fire frequency was an important ecological agent in maintaining trackways even through dense rain forest. On the mainland, where extensive burning was an ethnographic reality, similar effects are suggested. Indeed, if Pleistocene con-

ditions on the inland plains were dry and windy, dry-season fires may have proved catastrophic.

Possibly the most serious blow to the conservation of native fauna in prehistoric Australia was the introduction of the Aboriginal dog, the dingo. However, there is no evidence of its presence during the Pleistocene. Its absence in Tasmania is interpreted to mean that its introduction post-dated the formation of Bass Strait, some 11,000 years ago. There have been few archaeological discoveries of dingo. The most substantial—a complete skeleton—was reconstructed by N. W. G. Macintosh, from 3000-year-old bones at Fromm's Landing. More recently, further remains have been excavated in South Australia, where at Mt Burr rock shelter, dingoes were present between 7000 and 8000 years ago. Although earlier northern evidence should be forthcoming, dingoes may not have assisted the Pleistocene extinction, and certainly did not in Tasmania. Their later role in eliminating smaller species or restricting distribution of recent fauna, however, cannot be under-estimated. Plates 18–20

It is evident that Man colonised Australia during the epoch of the larger fauna, and that they possibly co-existed for a long period. There is no evidence of a sudden mass extinction of the larger marsupials, and as the process of smaller-species extermination continued regionally until historic times, climatic factors seem unconvincing. As it is unlikely that hunters could eliminate numerous species totally over the continent, and as the dingo was a late-comer, it seems probable that the solution lies in vegetational changes induced by human activities which affected both herbivores and flightless birds.

CHAPTER III

Ethnohistory

The Aboriginal Inhabitants of the Colony of Victoria are an Erratic Race, their wandering habits however . . . arise as much from necessity as choice, they have no other alternative for subsistence but by wandering over the country in which Providence has placed them.

WILLIAM THOMAS, (1838)

ASSUMING 25 years for a human generation and the conservative figure of 25,000 years for the human occupation of Australia, 1000 generations of men have elapsed; at least 300 of them have enjoyed the companionship of the dog. If Birdsell's estimate of 16 years for an Aboriginal generation is adopted, the same period produced 1560 generations. Despite cultural and technological changes with time and adaptations with place, the Aboriginal response to Australian conditions was generally similar and it seems valid to apply terms such as Aboriginal *society* or *culture* despite the temporal and spatial pitfalls involved in such generalisations. This is a primary fact of Australian prehistory and a basic limitation which its prehistorians face, because the surviving archaeological evidence is restricted both in its variety and interpretative potential. For reconstructing the basis of society on the eve of European occupation, however, there are ethnographic and ethnohistorical sources to tap, but these must be used with restraint because many changes occurred since 1788 which distort the perspective. This chapter attempts to synthesise the various sources available in a sketch of the later stages of Aboriginal prehistory; Tasmanian prehistory is treated elsewhere.

ABORIGINAL ECONOMY

The exploitative techniques of the Aborigines were limited to combinations of hunting, fishing, gathering or foraging activities. They practised neither agriculture nor simpler horticulture and never domesticated any indigenous animals; even the

dingoes which they introduced but apparently never fully domesticated ate more of their masters' food than they retrieved for them. Aboriginal life was nomadic, while the number, frequency and distance of their shifts depended upon local conditions. On the Lower Murray River it seems probable that camps within restricted localities were semi-permanent, and this applied also to certain favourable coastal or estuarine situations. Possibly Thomson witnessed the extreme in near-sedentary habits on eastern Cape York. He lived for five months during 1928 with the fishing and dugong-hunting 'sandbeachmen' of eastern Cape York. During this period, camp was moved six times but the distance never exceeded about 300 yards on each occasion. But all these localities were exceptionally rich in food supplies and the population densities observed in some areas of Cape York and coastal Arnhem Land were possibly atypical of earlier prehistoric practice. Apparently in late prehistoric times these northern areas were subject to Papuan and Indonesian technological influences; such as dug-out canoes, harpoons and metal, which probably enabled a more efficient, intensive and daring exploitation of marine resources than was possible with traditional craft and fishing gear, although whether this resulted in a greater population density is conjectural.

The further possibility cannot be overlooked that although some areas studied by anthropologists were superficially 'prehistoric' in social and economic structure they had been influenced indirectly by diffusion of ideas promoted by European activities. For example, 50 years before Thomson studied the dugong hunters of Cape York, a visitor to Somerset at the entrance to Torres Strait remarked that 'Cape York is a sort of emporium of savage weapons and ornaments.' European museum curators should note his warning that the police stationed at Somerset sold curios to passing ships. 'Hence all kinds of savage weapons [including the bow] have found their way into English collections, with the label "Cape York".' As an example, I

noted in the Giglioli collection in the Pigorini Museum, Rome, a large obsidian spear point (No. 2831) which is attributed to Cape York, 1875, but which is almost certainly of Admiralty Islands origin.

In less favoured areas of the continent, however, camps were moved more frequently and over greater distances: in drier areas it was sometimes a day's trek to the next rock pool. William Thomas who lived with the Aborigines in the well-watered Melbourne area from 1838 (within four years of European settlement) recorded that camp was shifted after about three days. Even in western Cape York, Thomson found that the dry season was spent wandering in the hinterland, apparently at some distance from the coastal wet-season area.

This regimen inhibited those technological developments which leave useful material traces for later excavators. There was little incentive to build permanent houses or experiment with the storage or preservation of food. There is record of the hoarding of grass seeds in Central Australia, or of sun-drying flesh and fruit, but such occurrences were limited in place and volume. This does not imply that the Aborigines were improvident, but that difficulties were too complex. Even where conditions permitted fairly sedentary habits, ceremonial and other social demands, or the seasonal attractions of some locally abundant food source, provided the stimulus for movement. Domestic possessions therefore were few and utilitarian. They needed to be light, preferably multi-purpose and no more numerous or bulky than a man and his wife, or wives, could carry on a day's hike. Consequently, woven fibre or *Pandanus*-palm baskets, hair-string or paper-bark bags, bark containers and wooden 'coolamon' carriers-cum-water containers were better adapted to Aboriginal needs than pottery. The only ceramics in pre-European times were the pots discarded by the trepangers.

Plate 24

LEILIRA BLADES

An economy in material equipment was characteristic of every habitat, but was most striking in Central Australia. During their

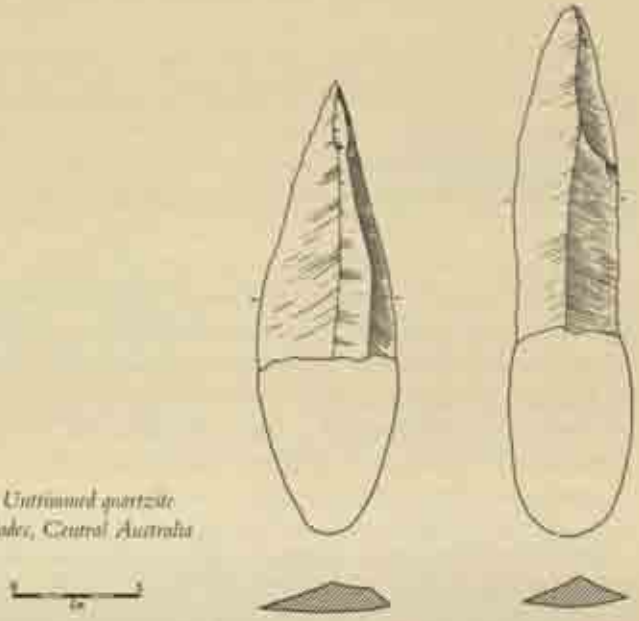


Fig. 6 Untrimmed quartzite leilira blades, Central Australia

habitual but planned nomadism, the women carried the 'household' possessions—a wooden digging stick, and in cool weather a firestick, being the prize items. The hunter travelled light, with a small but remarkably adaptable tool-kit which consisted of wooden implements, some of which were hafted with stone or bone. One of these was a multi-purpose stone knife with a resin hand-grip, or resin-hafted wooden handle, which Spencer and Gillen termed 'leilira', a term which has been applied loosely to a variety of Australian tools, but which is better used in this original restrictive sense. Leilira knives carried by men were usually massive, pointed trigonal primary flakes (blades). A collection of 91 such hafted knives was measured in the South Australian Museum. The length (handle or grip included) ranged from nine cm. to twenty-two cm. (mean 15·3 cm.) and the width of stone blades varied between 3·3 cm. and 8·6 cm. (mean 4·4 cm.); only thirteen specimens bore traces of secondary

Fig. 6

Fig. 7 Chert 'Woman's knife', Barrow Creek, Northern Territory

retouch. Conversely, knives used by Central Australian women possessed blades which were extensively trimmed, with rounded distal ends. There are also long hafted blades in ethnographic collections with carefully squared extremities. A comparable blade was excavated from late deposits at Kenniff cave, southern Queensland.

As pointed blades of exactly the same form as leilira are known also to have served as spear points and as the heads of fighting picks over wide areas, it would prove difficult for an archaeologist to assign a positive function to isolated stone components. Even possible microscopic analysis of use fracture is minimised on most specimens, as coarse-grained quartzite constitutes the commonest raw material. Indeed, these points are so simple in form that the majority could not be recognised as implements, as distinct from rejected waste material. Baldwin Spencer watched the production of these long blades in Central Australia and observed that for every acceptable blade, a score of similar specimens was discarded by the knapper. On one afternoon at Camooweal, north-western Queensland, W. E. Roth watched four old men strike off a total of 300 flakes before one was considered suitable for hafting as a knife blade. The Aborigines along Cooper's Creek made archaeological confusion confounded, by placing gum hafts over sharp-edged flakes of fine-grained stone. The tool's function as a cutting implement is undoubted, but such rather formless flakes would be classified as 'waste' by any typologist; yet when seen as a series, it is evident that the flakes were produced according to a pattern, and that they were sharp, efficient tools. N. B. Tindale has documented a similar technological situation in the Western Desert region of South and Western Australia.

The most individual items of equipment, and ones which may prove to have been indigenous inventions, were the tula adze (or chisel) in Central Australia and adaptations of spear-throwers with stone adze-flakes mounted on one end over a wider area. The tula handle was grasped with both hands and worked to-

Fig. 8 Square ended quartzite knife, Hugh River, Central Australia

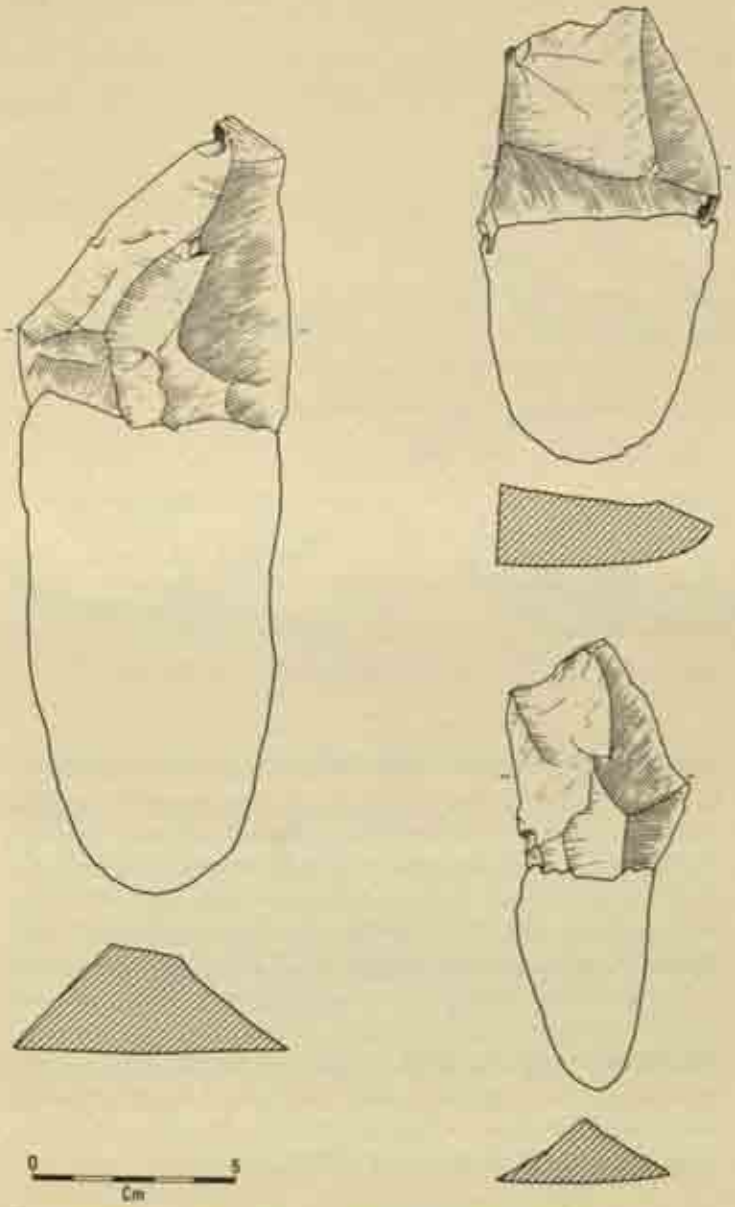


Fig. 9 Hafted, chert primary flakes, Cooper's Creek, South Australia

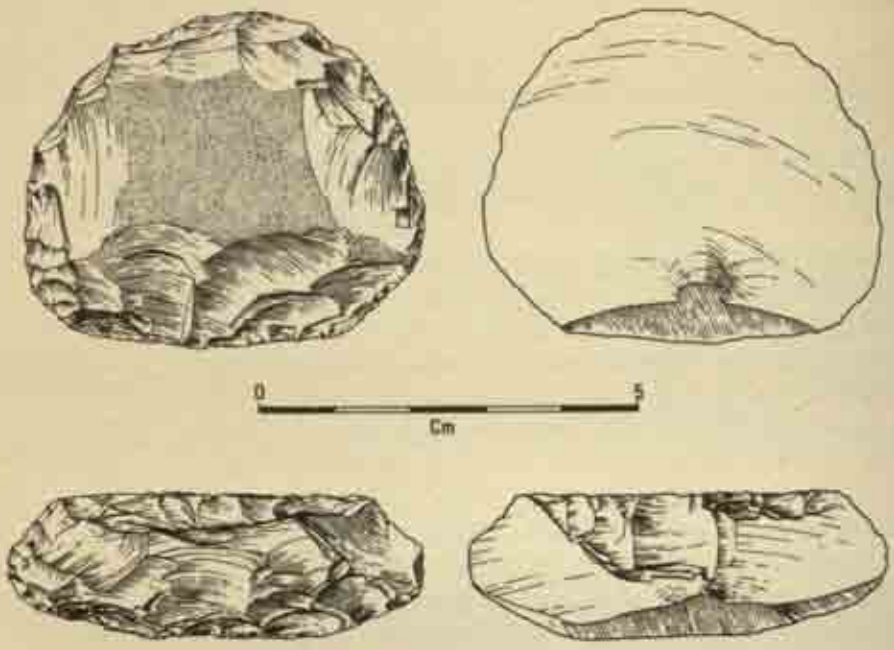


Fig. 10 Tula adze-flakes, Mulka, South Australia, fine-grained quartzite

THE TULA ADZE

wards the operator, for a variety of cutting, shaving, incising and scooping purposes. The stone working edge required continual resharpening, which resulted in a step-flaked, undercut edge. This progressive modification, due to re-trimming and resetting the flake in its adhesive matrix, resulted in decreasing size. As a consequence, these characteristically step-flaked tula adze-flakes, with their obtuse-angled, plain striking platforms and relatively broad shape, are an important technological and cultural indicator on archaeological sites. Both their known distribution at the time of contact, and their archaeological occurrence is focussed particularly in Central Australia, although the distribution map is based on generalised rather than specific data. This subject is elaborated in the next chapter.

Plate 25

Fig. 10

Plates 21, 22

Fig. 11

Fig. 11 Generalized distribution of tula adze-flakes

There are also many hafted chisel-like tools whose cutting edges consist of simple untrimmed or irregular retouched flakes, embracing a broad morphological range, which lack the standardised tula features. Constant resharpening of such flakes produced comparable undercut edges and reduced size. Again, both tula-flakes and these random flakes may have been reversed in their adhesive matrix, so that the opposite edge (or bulbar surface) became the working face. Frequently, flakes worn on both margins so that the ends became pointed, were further reset, with a pointed tip serving as an engraver. McCarthy termed a tula adze-flake worn on both margins, a 'burren' adze-flake. Other workers possibly employ the latter term more loosely to describe most non-tula types. The difficulty is that a tula adze-flake may

Plate 24
Fig. 12

Fig. 12 Unmodified and pointed jasper burren adze-flake, Injaladdi, 1963, square 4, spit 4

Plate 23

have all trace of its diagnostic striking platform removed, so that it cannot be distinguished from worn specimens of the generalised variety.

Granted that tula adze-flakes are widely recognisable in many regions, but that they never occur in others, while 'burren'-like examples are distributed both concordantly and independently, it does seem that the differentiation may possess cultural or technological significance. For example, in central areas, both types occur as hafted ethnographic specimens or in remnant prehistoric surface collections, but in eastern, north-eastern, and possibly some western and northern areas, tula adze-flakes are conspicuously absent. Curiously, the Victorian border was respected by users of all varieties. Neither prehistoric nor ethnographic examples are recorded within that state, although both burren and tula types occur along adjacent South Australian stretches of the Murray River.

In addition to those tools intended primarily for heavy chopping, gouging and incising activities, in some areas spear-throwers were equipped with adze-flakes for less vigorous functions. In the Western Desert region, such tools were used for maintenance purposes, to repair rather than to manufacture implements. Therefore they served functions appropriate to spoke-shaves, engravers or knives, for which purposes the two-handed grip was unnecessary. In these instances, while the proximal end of the spear-thrower served as such an adze, the broad, curved, central portion was used on ceremonial occasions for mixing ochres or holding blood and as a parrying stick; it also made an admirable scoop for digging out lizards.

In tropical Cape York, the enlarged panel in the middle of the spear-thrower substituted for a parrying shield. However, because of the rich resources in Cape York and Arnhem Land, extreme economy in equipment was less evident, although adaptation to local materials was striking. Most implements and utensils were made from various plant fibres, leaves and bark,

shell, stingray spines, shark teeth and marsupial incisors. An example of efficiency in exploitation of resources was observed by Thomson in Cape York. Dugong-hunters used a four-strand rope made from the strong, elastic, bast of *Hibiscus tiliaceus* for harpoons. One rope measured 199 feet long, yet it weighed only four and a half pounds.

This emphasis upon the use of general-purpose implements and perishable materials ensured that normally few material traces of everyday life survived for the archaeologist. Yet the meagre non-organic remnants—adze-flakes, axe-heads, stone knife blades—constitute the evidence from which prehistorians define 'cultures' in the later prehistoric phase, unless they also draw upon the ethnographic and ethnohistoric evidence, thereby risking erroneous identifications and anachronistic attributions.

DIET

As Aboriginal economy was parasitic upon the environment, it imposed further archaeological disabilities. Because food was not hoarded, the forager ate what was available. Because of the inability to preserve meat and seasonal factors affecting availability of game, this meant that contrary to popular belief, Aboriginal diet was to a large extent vegetarian. Meggitt noted that the Walbiri people inhabiting arid lands subsisted on a diet which was possibly 80 per cent vegetarian, while further west again, the Bindibu (Pintubi) groups studied by Thomson were sustained on plant foods for weeks at a time. Thomson, and also McCarthy and McArthur, had found previously that plants were always important items in both tropical Cape York and Arnhem Land, and in some seasons they provided the staple diet. In such areas it was therefore the women and not the more statuesque hunters who provided most of the menu and who ground or pulped the seeds, roots or fruit collected; they also caught many reptiles, the most common flesh food and protein source in Walbiri country; and on the tropical coast they supplied crabs and shellfish.

The problem facing an archaeologist aware of the general ethnographic dietary pattern is that his difficulties are multiplied.

Usually, material traces upon open camp-sites would soon perish, but if they did survive, it is likely to be naturally selected evidence: food bones and shells may be preserved but plant remains will not be. Consequently, an Australian prehistorian is aware that the meagre excavated faunal remains may imply erroneously that flesh was the dietary basis of a so-called hunting society. The sexual division of labour which provisioned the group and the organic utensils used to gather and prepare any vegetable foods have probably gone beyond recall, except for the presence of ubiquitous grindstones.

There is also the question of personal preference. It is probable that during pre-pastoral times it was easier to obtain minimal food and water supplies and this may have allowed fuller scope for seasonal selectivity of food. It is relevant to note Meggitt's observation that the Walbiri did not gather certain plants which were eaten by other tribes, but whose taste did not appeal to them, while in good seasons, smaller, less palatable creatures were ignored. Early settlers at Sydney recorded a marked preference for fish by local Aborigines, while contemporary Tasmanian testimony unanimously observed that Tasmanians never ate fish. Further, if the social group occupying a site had positively avoided eating certain totemic animals, this would make for distortion of the archaeological interpretation of its faunal record.

WEIPA SHELL MIDDENS

Two areas of tropical coast offer extraordinary examples of selectivity in diet and in location of refuse tips. These are the immense shell mounds at Weipa, Cape York, and Milingimbi Island, Arnhem Land. At Weipa there is a variety of shapes, ranging from circular mounds to long, steep ridges reaching a maximum height of about thirty feet. Some occur within existing mangrove swamps while others are half a mile from present high-tide mark, but the largest examples are located about 200 yards distant from this level. These large deposits consist chiefly of cockle shells, and excavation has shown that they accumulated *in situ*. Concentrations of charcoal, faunal remains and some

Plate 26

stone and bone artifacts prove that these mounds were accumulated through human activities.

Despite their height and confined and uncomfortable space, they were popular camp sites. W. E. Roth visited them in the late nineteenth century and saw huts and fireplaces on top of some mounds. In coastal Cape York, Thomson found that shellfish were eaten as a wet season food, and therefore the mounds may be interpreted as a seasonal preference for camping on a waterlogged landscape. Support for this was provided by Roth, who suggested that the steep climb was worth while, in an effort to escape the ravages of mosquitoes and sandflies. It is interesting that exploratory excavations by R. V. S. Wright recovered many bi-pointed bones, which are similar to those described for the region by Thomson as being components of fishing spears, harpoons, fish-hooks and other items in the recent Aboriginal tool-kit. Their size and tonnage proves deceptive, because, to judge from one of them, their accumulation was comparatively rapid. Radiocarbon samples collected by Wright proved that a twelve-foot-high mound is less than a thousand years old.

MILINGIMBI MOUNDS

The Milingimbi shell mounds were circular or oval in shape, and before most of them were destroyed for airfield construction, several attained a height of over 20 feet and a diameter of perhaps 90 feet. As at Weipa, they vary in their distance from high-tide mark, but on low-lying Milingimbi, the approaches to most of them would be marshy during the wet season. Excavations by Lloyd Warner in 1927 and McCarthy and Setzler in 1948 have shown that Aboriginal hearths and sporadic stone tools occur throughout the accumulations, which are predominantly cockles, although gastropods are common. In 1965 I collected charcoal from near the base of Garrki mound, one of the largest heaps and originally over 20 feet high. As quarrying activities had removed its centre, the sample was taken from near the perimeter, where its age was 1305 ± 80 years (A D 645: V-61). As will be seen, the shells were loosely piled and intact.

Plate 27

However, at near-by Macassar Well, which is partly enclosed by a low semicircular shell mound overgrown with mature tamarind trees, the shells are compacted and fragmented. Two charcoal samples collected near the base of the mound indicate that its accumulation began in the fifth century B.C. W. Lloyd Warner made Australian geochronological history here in 1927, when he cut down tamarind trees in order to establish a *terminus post quem* for the midden by dendrochronological investigation of their trunks. At that stage he found that *tamarindus indica* has a growth pattern unsuitable for such analysis. Despite its allusive name, no one has recovered Macassan relics from Macassar Well shell midden, and its antiquity obviously pre-dates any trepanging activities in the area.

To judge from historical records, it is likely that in cool temperate regions where preservation was less difficult, flesh foods were relatively more important and that vegetables provided variety rather than the basis of most meals. 'Their stable subsistence [sic] . . . was the kangaroo,' wrote William Thomas of the Melbourne Aborigines. Eyre and Brough Smyth confirm this emphasis on marsupial, fish and fowl foods in parts of South Australia and Victoria. Indeed, on lakes and rivers, fowling was of major dietary importance, to an extent possibly greater than in any other part of Australia. On the other hand, the technology of the people they described was characterised also by simplicity, portability and adaptability.

In south-eastern Australia at the dawn of its history, offensive, defensive and hunting weapons were made almost exclusively from wooden or other organic materials, and when composite tools were preferred, organic supplies such as reeds and bone were selected rather than stone. Everyday implements carved from solid wood included a complex variety of clubs, throwing-sticks and boomerangs, shields, most spears and many spear-throwers. Almost the only composite tools utilising stone were edge-ground axes, some of them very small and mounted chisel-like, with the

butt in a cleft stick, and fighting spears, barbed with jagged and untrimmed stone chips fixed in resin. It is surely ironic that the appellation 'stone age' was foisted on societies such as these. Plates 28, 29

ENGRAVING TOOLS

Although their wooden tools were richly decorated with incised linear and geometric designs, there is no evidence that prehistoric Victorians ever hafted stone adze-flakes on tulas or spear-throwers. They resorted to alternative woodworking techniques, at times using the miniature edge-ground, end-hafted chisels. Normally, however, their gouging and engraving tools were marsupial incisors. Adaptations of lower jaws of possum, wallaby or kangaroo as tools were virtually universal on mainland Australia and the infrequency of reference to their use is perhaps due to an over-emphasis by modern workers upon stone tools, and on the adze-flake in particular.

Single incisors mounted on sticks were used in some areas including Cape York, but more often the entire jaw was retained, the bone providing a firm bed for the incisor and a grip for the user. Central Australians added a gum haft to the ascending ramus, while in Queensland and Victoria wooden handles were attached with sinews or fibre. Brough Smyth was the first to describe this implement, which he termed 'leange-walert', and the actual specimen which he figured in 1878 is preserved. The tool was drawn towards the user, and the fine fluted groove which it left has stamped tools decorated in this manner as distinctive craft products. It is evident that this widely used tool served multifunctions, including incising and drilling holes in stone tjurunga, and that it substituted as burin, drill, chisel and even as skin-scraper. Because most of the incisors in ethnographic specimens examined are broken or worn, this fracture should make it possible to identify excavated examples. At Malangangerr, Arnhem Land, Dr C. White excavated two wallaby incisors in contexts dating from modern to 6000 B P, both of which bore use-gloss and one was worn and broken. Plate 30 Plate 31

SKIN DRESSING

Colder southern conditions forced the mainland Aborigines to wear clothing, with possible consequences for the archaeological record. Written comments testify to the prominence of marsupial-skin dressing and sewing in daily life. Possum skins were the warmest and most suitable animal pelts, and cloaks are recorded extensively throughout southern regions, although only seven examples are known to have survived. One Victorian rug contains 81 skins and measures seven feet six inches long and five feet six inches wide, while another was made from 50 pelts. Many descriptions testify that the process of manufacture was laborious. The skin was first stretched out tightly over a sheet of bark, using pegs of bone or wood. Ashes were then rubbed into it to absorb grease and a slow drying fire was lit near-by if conditions warranted. In order to render the skins pliable, it was usual to scrape and score them with mussel shells, long pointed bones or sharp-edged stone flakes. These linear markings possessed a second function, as they were arranged in simple but attractive patterns, usually geometric, which were visible when the cloak was worn inside-out, as a natural rain coat. The skins were sewn together with sinews, using holes pierced with pointed bone awls. After further greasing, the cloak was worn fastened with a long pointed bone or wooden toggle pin. It is small wonder that a contemporary observed that these products of the Aboriginal furriers' art were permeated by 'a most offensive smell of combined grease and woodsmoke'.

Plates 35, 37

A. W. Howitt was informed by Barak, who witnessed the final operations at the Mt William axe-stone quarry north of Melbourne, that during the ceremonial exchanges transacted there the donor of a possum rug was the recipient of three axe blanks. If this was so, it indicates some recognition of the effort represented in making rugs.

Archaeologists assume that stone 'scrapers' with edge retouch frequently served for skin dressing. Whatever the validity of this attribution, and it is questionable, southern Aborigines were not

observed using them, and mussel shells or 'smooth stones' played a much more important role in this respect. It has been suggested, however, that in central South Australia from the Adelaide area to north of the Flinders Ranges, special stone tools were devised for the purpose. These were kidney-shaped (reniform) slate scrapers, which averaged 11 × 7 × 0·7 cm. in thickness. Use-polish along the intentionally shaped and thinned concavity indicates a functional edge which was so smooth that it was well suited for scraping delicate skins, perhaps held firmly against a rounded stick. Unfortunately, there is only one circumstantial account of their actual use for this purpose. As this distinctive type possesses additional individuality in that many specimens bear scratches and simple linear decoration, it could prove an important cultural-technological marker, but so far no specimens have been excavated. Plate 32

ELOUERA

Another implement type which is sometimes characterised by use-polish gloss is termed 'elouera'. The type was first identified in the Sydney region, but examples are known from Laura in Cape York to the Murray River in South Australia, with sporadic occurrences possible elsewhere, including Millstream, Western Australia. There is a concentration of what is classified as the same tool at Oenpelli, Arnhem Land. The elouera is a triangular-sectioned flake or blade, resembling an orange segment, normally with bi-directional blunting retouch or step flaking on the thick back. It therefore resembles an outsize geometric microlithic crescent, although it must be considered as a discrete type. On the thin edge, or chord, an elouera may possess either varying degrees of use-fracture, trimming, or use-polish, extending back from it on one or both surfaces and frequently quite extensive. Unfortunately, the ideal shape and proportions are seldom attained, so that divisions between elouera and smaller, backed blade tool types on one hand and scrapers on the other are blurred; the fact that it has sometimes been termed an adze has not clarified matters. The significance of the tool as a possible cultural correlate *Fig. 13*

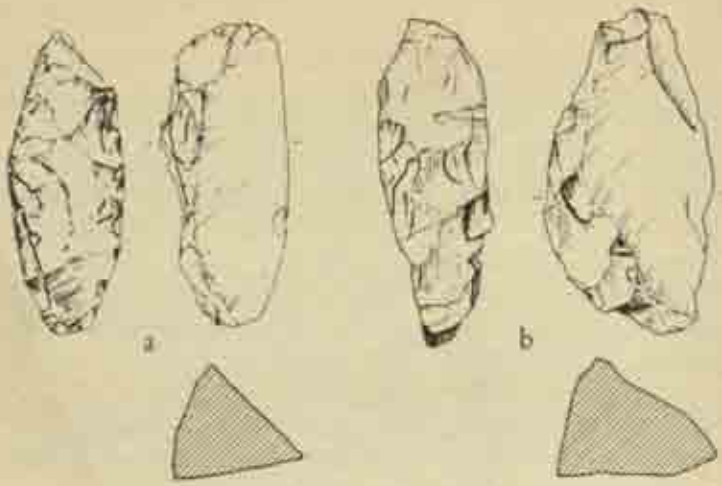
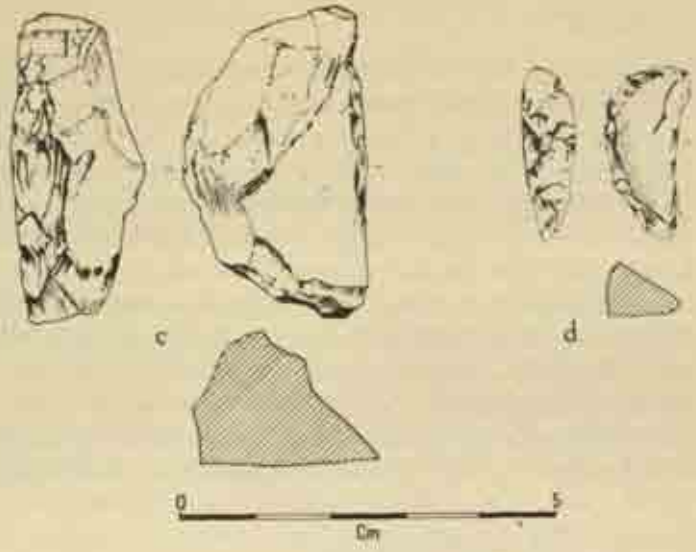


Fig. 13 Elouera, east coast N.S.W. a, Merewether; b, Murramurrang; c, Lake Illawarra; d, Burrill Lake excavation, M[1

is discussed below. It is necessary to observe here that its occurrence in eastern Australia is assumed to be in later prehistoric contexts, although there is no positive ethnohistorical or ethnographic evidence that it was still in use in 1788, while specimens 4000 years old have been excavated in widely separated areas.

In New South Wales, use-polished elouera are less common than are trimmed, thin edges. However, at Oenpelli, the case is reversed, as almost all examples are use-polished. In 1948, Setzler and McCarthy recovered a hafted tool in a rock shelter at Oenpelli which they interpreted as an elouera, and its presence is an additional indication that this type was a late survival. Some archaeologists question, however, whether the Oenpelli type is indeed the same as that in eastern areas, and stringent analysis is warranted in both regions. But the fact remains that this specimen was not end-hafted as an adze (or chisel) and the presence of sheen rather than edge fracture suggests that its function was different. Indeed, more than 55 per cent of the stone tools excavated on Arguluk Hill, Oenpelli, possessed use-polish, although such tools are

Plate 11



relatively uncommon elsewhere in the area. Consequently, Dr Carmel White has suggested that some specialised industrial activity was practised there.

Unfortunately, even in 1948, Aboriginal informants were unable to give specific information concerning the functions of this tool. McCarthy suggested several uses, including paring bark or wood and dressing skins, and this is a research field of some merit. It seems that use-polish must have been produced by action different from that which fractured the working edge. Dr McBryde has established that use-gloss can be produced by smoothing sheep-skin, but in this experimental situation, she found that it was not a by-product of cutting plants. It is assumed generally that many stone scrapers were used for skin dressing: if this was the case, they might be expected to possess polished surfaces, which is not the case in Australia.

In 1844 George French Angas painted a family group near Portland, in western Victoria, which illustrates the nature of late prehistoric society. The reed mats, baskets and wooden imple- CULTURE CONTACT Plate 14

ments portrayed show characteristic crafts of the region and the man reclines on his multi-purpose cloak; obviously little in this assemblage would survive long. Less than 40 years later a photographer visited Coranderrk Aboriginal Reserve, near Melbourne. His posed family group is a remarkable document in the vagaries of culture contact. Wooden weapons, baskets and string bags are evident links with the little-changed past, as are the warm, decorated possum-skin cloaks. Civilisation is represented by mutton-chop whiskers, a wire hook, a tin billy (portable as baskets and more useful) and the absence of children. The object in the bottom left of the photograph recurs in another view, as a bark canoe. Such canoes were in use in south-eastern regions at the time of European penetration and were the standard craft on the Lower Murray River. This particular canoe was evidently cut from its tree with a steel axe; hand-held stones battered the edges more, but the resulting craft was the same.

Plate 35

Plate 37

cf. Plate 56

Victorian mores were epitomised in the State of that name by more than Gladstonian side-whiskers. Cleanliness, that great virtue, was promoted by the Victorian Board for the Protection of Aborigines in 1877, when the thousand or so surviving Aborigines were issued with 10,508 lb of soap. They also received clothing of ample and decent proportions designed to put Aboriginal furriers out of business (721 serge and twill shirts, 584 trousers, 121 dresses, 107 petticoats and 285 chemises). The result is illustrated in an historic photograph taken by A. W. Howitt around 1884. It shows members of the Brabralong tribe of Gippsland, including Howitt's chief informants for major portions of his monumental *Native Tribes of South-East Australia*. Thus garbed, they were performing a ceremony at Howitt's instigation. The mythological ancestral beings concerned must have possessed mixed feelings, while it provides visual insight into anthropological field methods of the time.

Plate 36

BONE TOOLS

The evidence for prehistoric rug-making suggests, however, that if the Victorians preferred their savages clothed, they only

high-lighted a trend inherent in later prehistoric society. At least this is one interpretation of recently excavated evidence, which establishes that later prehistoric Aborigines utilised bone to a marked degree. The most striking indication of this bone industry was recovered from two small rock shelters at Glen Aire, on Victoria's Otway Peninsula, where an early occupation layer was dated as recently as 370±45 years ago. Only four trimmed stone implements were identified from an excavated sample of stone flakes totalling 2278. However, there were 66 bone artifacts present, mostly made from marsupial bones. Both here and on other recent Victorian coastal midden sites, the majority of bone implements were either single- or bi-pointed (fusiform) marsupial bones, whose length variation—between four and fourteen cm.—implies diverse functions. *Fig. 14*

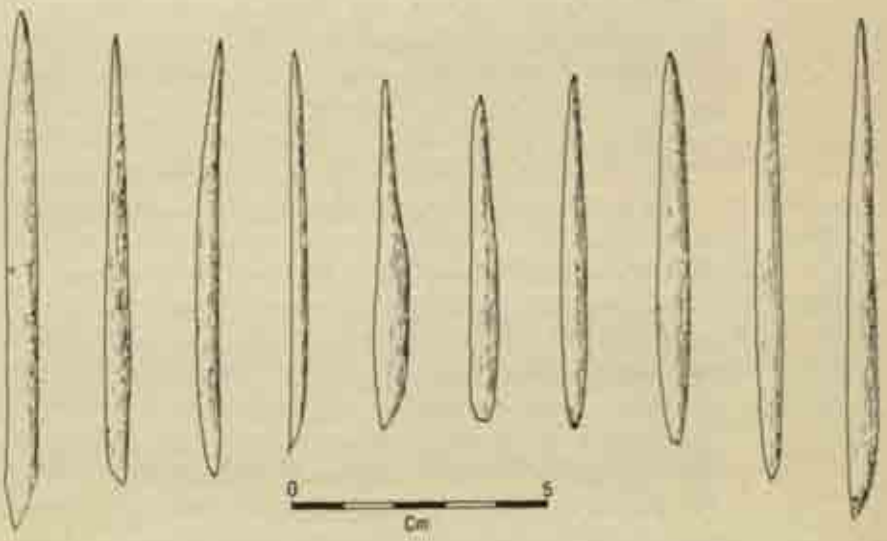


Fig. 14 Bone points excavated at Glen Aire, Victoria

It is interesting therefore to consider the variety of purposes which Brough Smyth listed for bone tools employed in the process of cloak manufacture. It required large numbers of pegs, awls and pins for stretching, scoring and subsequently sewing and fastening cloaks; he suggested further, that bone spatulae served to flatten and smooth seams between skins. All these artifacts might survive archaeologically, together with the stone-sharpened mussel-shell scrapers which he mentioned as employed in the industry. Without pushing this Victorian bone evidence too far, and allowing for other functions such as spear points or nose-bone ornaments, these Victorian industries may reflect the prominence of skin dressing.

Although the rarity of excavated sites renders generalisation difficult, it does seem possible that older deposits in south-eastern Australia do not contain such numbers of bone tools, but this is a matter for future research. It prompts conjecture as to whether clothing habits changed during later prehistoric times, and if this was the case, whether it was a response to worsening climatic conditions, or whether it was due to increasingly efficient and sensible adaptation to regional circumstances. At all events, climatic rigours did not bother the Tasmanians at the end of their prehistory: usually they were clothed as nature had provided.

EVIDENCE FOR FISHING TECHNIQUES

Fig. 15
Plate 38

The evidence from coastal New South Wales requires a different function for the bone points found in recent deposits. Widespread ethnographic data establish the importance of multiple-pronged, bone-tipped, wooden fish-spears as basic items of material culture. Three specimens which were collected by Captain Cook at Botany Bay survive today, while others were depicted in use by early colonial artists. Apparently these examples were provided with tips or barbs of marsupial bone or fish spine. However, in his important excavation at Durras North, R. J. Lampert recovered a specialised industry, dated more recently than 480±80 years ago, which extensively utilised bird bones. This industry of bone uni- and bi-points is best interpreted as

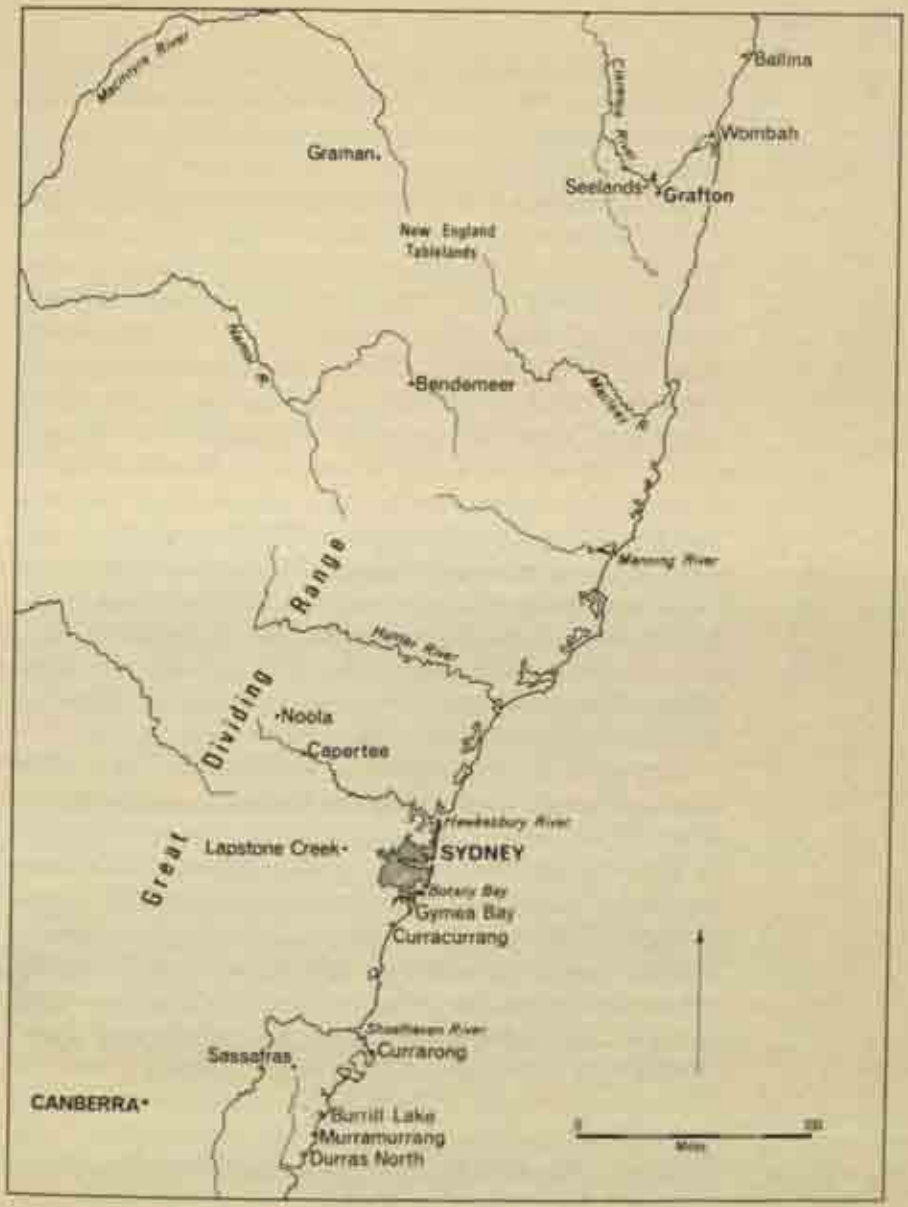


Fig. 15 Location of chief sites mentioned in eastern N.S.W.

Fig. 16 Crescentic shell fish-hook with lateral filing marks, Durras North excavation, level 11

chiefly providing the tips and barbs of such fish spears. Lampert's meticulous study has shown that close attention to the dominant forms of bone tools on a site has considerable diagnostic potential for cultural analysis.

Another interesting discovery concerned the use of shell fish-hooks (*Ninella torquata*). Each of the five specimens was roughly crescentic, with a small notch towards the end of one tip, presumably for attaching a line. They are typical specimens of a type known during the last century along most of the east coast. These hooks have filing marks visible along both external and internal edges. W. E. Roth described the manufacture of similar hooks in Queensland. It was first necessary to chip the shell into a roughly circular disc between two stones. The centre of the disc was then heated until it became brittle, and a hole forced through. In Queensland, coral fragments were readily to hand as files, to trim the edges and cut through a segment of the ring to form the hook. Interestingly, Lampert was able to identify some discs at Durras North which presumably were fish-hook blanks. But in these cooler waters coral 'files' were unavailable, and slender, pointed lengths of micaceous schist served instead. At Durras, however, the hole was filed without the heating process.

Fig. 17 Fish-hook file of micaceous schist, Murramurrang. Length: 7 cm.

Stone fish-hook files of cylindrical or roughly leaf-shaped form are common implements on east coast surface sites. As at Durras North, their dated contexts appear recent, while their use is attested in early European accounts of the Sydney area. At Curracurrang they belong to the latest stages of the occupation, while Megaw has excavated further sites in that area with comparable results; they were also present at Gymea Bay. Although slight, this evidence is a pointer to the importance of shell as a raw material in later prehistoric times, a detail which Eyre and Brough Smyth emphasised.

In Arnhem Land, fishing spears (usually tridents) have survived into the ethnographic present, and these are comparable with the New South Wales specimens, only iron prongs

have been substituted. However, at Oenpelli as late as 1912, Sir Baldwin Spencer collected spears tipped with marsupial bone points. X-ray analysis, prompted by Dr Carmel White, has demonstrated that their bone components were fusiform points which had been inserted into splits at the extremities of the wooden prongs and cemented in place with resin. Symmetrical bi-points of this form have been widely termed *muduk* in Australia and Indonesia, a name which was first applied to bone fish gorges (toggles) on the Murray River. It is salutory to observe, however, that while many coastal New South Wales, Cape York and Oenpelli examples are typologically similar, they are known to have served functions as diverse as spear and harpoon points or barbs, components of composite fish-hooks, and even nose-bone ornaments. It is unwise therefore to apply the South Australian term *muduk* to the entire genus of bone bi-points. Plate 39

LATE STONE INDUSTRIES

The excavations at Glen Aire and Durras North high-lighted a further characteristic of late-prehistoric material culture in the south-east. This was the rarity of retouched and typologically classifiable stone implements, a matter touched on earlier in respect to the ethnographic record. At these rich bone sites, trimmed stone tools were insignificantly represented, and this situation is repeated in excavations in the Sydney region. In rock shelters at Gymea Bay, Curracurrang, Connel Point, and Sassafras I, the variety and density of tools decreased in the upper horizons. The pattern of occupation suggests that some specialised implement types gradually went out of production, and that this apparent simplification of the tool kit, in which miscellaneous trimmed pieces and primary flakes became proportionally more significant, does reflect a basic feature of later prehistoric occupation. However, as most of the Sydney area excavations await detailed analysis and publication, the problem is an open one. Nevertheless, it is interesting that further north near Grafton, on the Clarence River, Dr Isabel McBryde has found comparable

evidence. At the Seelands shelter, earlier occupants used a variety of specialised stone tools, whereas the last few centuries witnessed a decline both in the quantity and quality of the industry, and this is supported by the evidence on several other New England sites.

Fig. 18 Fabricator quartzite, Burrill Lake, NSW (excavated)

One interesting aspect of these later changes was the increasing use of 'fabricators'. Probably classified in Europe as *outils écaillés*, these are flakes possessing scaled flaking on opposed margins, which also are bruised and splintered. The flaking is usually bifacial and worked from the four edges, thus giving the flake a quadrangular form; there seems to have been a preference for white quartz as raw material. This type was first discerned by Sydney-based workers, who described it as 'flake fabricator', and assumed that it served as a punch in fine stone working. Current distribution is concentrated on east coast sites, but it may be relevant to observe that Victorian-based stone collectors may have failed to recognise it. For example, S. R. Mitchell does not mention fabricators in his comprehensive *Stone-Age Craftsmen*, although he collected widely on classic New South Wales fabricator localities.

It is interesting that fabricators were relatively numerous in the latest occupation layers at Gymea Bay, Sassafras, Connel Point and Curracurrang, at a time when the manufacture of specialised stone tools had ceased, and it is therefore doubtful whether the fabricators were used for flaking stone. My suggestion is that fabricators were used primarily to split bone. If this was the case, their relative increase in popularity accords with other evidence on the east coast, that extensive bone utilisation occurred during late prehistory.

All these excavations in New South Wales belong to the past few years. Before this comparative evidence became available, excavations on the Lower Murray River had prompted similar interpretations. At Devon Downs shelter, the lower layers contained a distinctive and reasonably large stone assemblage, but the excavators observed of the topmost six feet, that 'exhaustive search

did not bring to light any stone implements of definite type'. My own work on the two Fromm's Landing limestone shelters produced a smaller bag of finds, but the contrast there between earlier stone typology and later indications provoked my comment that the later artifacts 'were few and generally crudely made'. It is relevant to note that although fewer bone tools came from the later occupation of these sites than from middle horizons, this must have been a misleading result. Ethnohistorical sources testify to the importance of bone in the regional technology.

ADAPTIVE PHASE

Research in the south-eastern portion of Australia therefore prompts the hypothesis that recent centuries (precise dating is available in only few instances) witnessed a 'degeneration' in stone craftsmanship, edge-ground axe production excepting. More realistically, this is perhaps to be explained as a trend away from stone supplies towards the substitution of local organic raw materials. In other words, it may represent an optimum adjustment to local conditions; this relationship disintegrated with the arrival of European colonists. It seems reasonable to term this latest prehistoric phenomenon the Adaptive Phase. The clarification of its archaeological situation depends upon more extensive field work, particularly in areas where conditions may preserve the postulated organic artifacts. An ecological approach is essential to its elucidation, for only by analysing the environmental data in the same detail as the stone artifacts, can this hypothesis of local adjustment be tested. That is why Lampert's investigations on the New South Wales south coast at Durras North, and his current projects at Burrill Lake, and the extensive middens at Murramurrang and Currarong are of such relevance, because a variety of ecological data is available there.

Although this trend away from specialised stone technologies was not characteristic of all Australia during the ethnographic past—in Central Australia and the Kimberley region, for example—it possibly was characteristic of parts of Queensland, Western Australia and Arnhem Land. Fresh from field work

in the Centre, Baldwin Spencer was surprised to find that in Arnhem Land, around Oenpelli, 'it is only rarely that any stone implements are met with'. Indeed, surface scatters of stone artifacts are very scarce on the Arnhem Land coastal middens, despite the relatively dense population of the region. This does not apply to edge-ground stone axes as they were in use over the entire mainland, with the possible exception of the south-west where they may have circulated as rare trade goods, and were occasionally imitated by local workers unfamiliar with requisite grinding techniques.

IMPLEMENTS OF THE SOUTH-WEST

South-western Australia is indeed one of the most tantalising regions awaiting systematic field work. The ethnography of its coastal inhabitants was described in some detail by early voyagers, because of its geographic position, yet no excavations have been attempted there. Material culture at the time of European contact was simple, and this fact has aroused the interest of diffusionists, some of whom envisage these Aborigines as relict early migrants living in Australia's remotest corner, thereby predictably lacking many 'advanced' traits which overlay cultures in more accessible areas. The absence of the edge-ground axe was one feature (perhaps not entirely correct) which has excited diffusionists, but there were other items. Further, their tool-kit was unique in possessing (or retaining?) traits assumed to have become obsolete elsewhere. Their most individual and useful possession was the 'kodja' axe, and Tindale exemplified earlier anthropological opinion when he designated this tool 'of palaeolithic facies', thereby stressing its 'primitive' nature. Such terms give the type a semblance of antiquity which has nowhere been established.

The kodja has one or two discoidal or semi-discoidal flakes, either trimmed or sharp-edged, set in opposite sides of a large ball of blackboy resin (*Xanthorrhoea*) or native pine gum (*Callitris*) mounted on the end of a thin handle, pointed at the grip end. Alternatively, one flake is replaced by a pebble hammer-

Plate 42

stone, so that the implement is a light general purpose axe-hammer-

adze. Therefore, while the hafted end-product is a specialised tool with few parallels outside the south-west and western coasts, the individual stone components are not, and if found separately they would normally escape detailed typological classification. The explorer P. P. King collected 40 kodja in one week's anchorage at King George's Sound in 1821, apparently for an exchange of fewer than twenty ship's biscuits. Today, there are at least 66 specimens in museum holdings throughout the world.

Another hafted tool whose distribution was even more restricted to the south-west was the 'taap' saw-knife. This consists of a row of small, irregularly shaped, untrimmed stone chips, fixed in gum adhesive on a short wooden handle (the wood was ungrooved). There are twenty-five taap specimens in the British Museum, four of which contain glass flakes and the number of stone teeth in the remainder ranges between two and eleven. King described the slaughter of seals by cracking their skulls with kodja hammers. They were subsequently butchered with taap knives in unconventional fashion—'After they have put within their teeth sufficient mouthful of seal's flesh, the remainder is held in their left hand, and with the "taap" in the other, they saw through, and separate the flesh.' In north-east Queensland, a similar knife was fitted with a row of shark's teeth. Plate 29

The Australian 'death spear' was hafted in similar fashion to the taap, although its distribution was not limited to the south-west. These spears possessed single or double rows of jagged barbs set in resin along several inches of the wooden tip. As many as 22 minute untrimmed chips of stone, usually quartz, (or glass and chinaware in late specimens) have been noted on museum specimens handled. The significance of such observations to the archaeologist is of a negative character, because these tiny flakes would be unrecognisable as components of an implement; indeed many of them would pass through all but fine-meshed sieves while use-wear on the numerous quartz specimens might

even escape microscopic identification. It has been suggested that these formless fragments were degenerate substitutes for carefully trimmed backed blades, including geometric microliths, which have been excavated and dated to earlier prehistoric times in eastern Australia. However, this plausible interpretation remains unconfirmed, while the full extent of microlithic distribution in Western Australia is a matter for future field determination. As microliths are recorded in the Perth area, however, it might be postulated that future excavations in the south-west may test this hypothesis. At the same time, it will be interesting to learn whether there was a trend in that region from earlier particular, to later more general techniques of working stone.

CEREMONIAL EXCHANGE

When Old World prehistorians cannot explain the purpose of a site or artifact, the time-honoured formula is to pronounce it 'ritual' or 'ceremonial'. Such invocations in Aboriginal Australia actually possess meaning for interpreting the dynamics of the diffusion of ideas. Throughout terminal prehistoric Australia and cutting across tribal and linguistic boundaries, there was a complex interchange of goods in a series of ceremonial exchange patterns which belie the notion that Aboriginal society was parochial and static. Earlier anthropologists observed these processes in action, but regarded them mainly as formal, though incipient, business transactions. As early as 1861, A. W. Howitt noted that objects were 'bartered' over great distances along Cooper's Creek, and he saw shields made from wood not growing in that region. He also knew of intrinsically valuable personal possessions being exchanged or given as presents. Towards the end of the century, Roth referred to 'local markets' operating in Queensland.

A truer appreciation of the essentially social nature of such activities was first achieved by W. E. H. Stanner. Stanner witnessed *merbok* inter-tribal exchange in the Daly River area during the early 1930's. His sympathetic account of the impli-

cations of these formalised yet restrained transactions constitutes a land-mark in Australian economic anthropology, and Stanner expressed its theme succinctly: 'It is the *gift* rather than what is given that matters.' Donald Thomson later observed comparable conditions in north-eastern Arnhem Land, when he studied the 'ceremonial exchange cycle', involving the reciprocal exchange of goods over distances of 300 miles. Although he failed to differentiate between the varying motivating factors and levels behind Aboriginal reciprocity, his opinion that the economic importance of the act was incidental to the Aborigines involved is crucial to the notion of ceremonial exchanges. 'It is the preparation for a visit to relatives within the ceremonial exchange cycle to discharge his obligations, the journey, the ritual, the formalities to be observed on arriving at camp, the niceties of behaviour and etiquette, rather than . . . the goods themselves, that he values.'

In an important survey of the literary and ethnographic sources, McCarthy traced the existence of definite patterns of distribution and fixed routes of movement which possessed mythological sanction as ancestral tracks. In some areas, group activities were determined by relationship with culture-heroes, resulting in craft specialisation which would defy archaeological explanation. Regardless of the availability of equally suitable raw materials elsewhere, if an ancestral being was credited with inventing a certain process at his creation centre, the local Aborigines concentrated on exploiting the raw material there for purposes of ceremonial exchange.

Perhaps the most striking example of diffusion concerns the occurrence of shell ornaments, which travelled thousands of miles. Baler shell (*Melo diadema*) inhabits the eastern coastal waters of Cape York. The shell was chipped and ground to form an oval ornament up to five inches long, and was suspended on a string through a perforation. As the distribution map of museum specimens indicates, examples penetrated across to South Australia. Pearl shell ornaments of comparable appearance were

Plate 40

Fig. 19. Distribution of baler shell and pearl shell ornaments, based upon museum collections and some references in literature

Plate 41
Fig. 19

produced in numbers on the Kimberley coast of north-west Australia, either plain or ornamented. The map of their distribution compiled from museum holdings shows an equally wide diffusion. Theoretically, therefore, a Lake Eyre tribesman could possess ornaments of Pacific and Indian Ocean origin, and after further ceremonial exchanges, eventually they could reach the shores of the Southern Ocean. European prehistorians may reach for their distribution maps of Black Sea *Spondylus gaederopus* shells in the Rhineland, or Egyptian faience beads in Wessex, and make up their minds which items make the most impressive pattern of diffusion.

Other distributions which require archaeological and petrological substantiation concern projectile points and axe blades. Baldwin Spencer believed that bifacially pressure-flaked Kimberley points circulated as far distant as the Gulf of Carpentaria and the Alice Springs District; Donald Thomson witnessed the operation of Nillipidji stone-spear quarry in eastern Arnhem Land and claimed that its products travelled far afield. The most famous of all stone quarries was the diabase outcrop at Mt William, Victoria. Extravagant claims, embracing four states, have been made concerning distribution of its axes and these require systematic investigation. A stone source near Cloncurry has been invoked also with great frequency by writers. At the present time, petrological studies of Aboriginal artifacts are in their infancy, although Dr McBryde is examining axe distribution in New England.

CULTURE AND DIFFUSION

The ceremonial value of some items of material culture produced unusual situations relevant to archaeological interpretation, where like forms are taken to indicate similar function. For example, over a long distance in Arnhem Land, boomerangs became clapping sticks, while in southern arid areas it seems probable that earlier prehistoric stone implements, such as geometric microliths or uniface pirri points, were collected on the ground and retained along with quartz crystals and other unusual stones for magical and ceremonial purposes, or alternatively they were rehafted by their finder and employed for functions never intended by their original owner, so that a missile point became a boring device.

Because of the prestige attached to an introduced item, there could be significant ramifications for the recipient group. D. S. Davidson witnessed the impact of such innovations upon the Wardaman of the Willeroo area, Northern Territory, in 1930. Although some 500 miles east of the Kimberleys, focus of pressure-flaked, bifacial spear-point production, the Wardaman were adopting these points in preference to their own more sturdy

projectile points. Assuming the validity of Davidson's observations, it is interesting that these objects had outdistanced the *knowledge* of pressure-flaking techniques; although the technological expertise had not diffused, the *idea* had done so.

At the time of his visit, local stone-knappers were attempting to produce crudely-made imitations from poorly selected rock which was unsuited to the technique. Meantime, the Kimberley originals which excited such admiration were liable to break easily, so that the adoption of these new, aesthetically satisfying and prestigious points really put to disadvantage the hunters who used them. Ride has inferred that comparable experimental adaptations of stone-grinding techniques took place in the south-west of the continent.

It seems reasonable to conclude from the analysis of 'recent' archaeological deposits, that for some centuries before European inroads, Aboriginal groups were living in apparent technological adjustment with their varying environments, and that stone craftsmanship was more the exception than the rule. Terminal prehistoric societies should not be judged (or classified) by their stonework alone. How recent was the decline in stone technology? Dr McBryde's excavations at Seelands and Bendemeer, in northern New South Wales, have indicated that the change there may have been comparatively recent. They contained the latest dated occurrence of geometric microliths and other backed blades, those ubiquitous, delicately trimmed and specialised tools of earlier prehistoric societies. Their date centres around the Elizabethan Age.

CHAPTER IV

Prehistory

Australia is so vast, and the dialects, customs and ceremonies of its inhabitants so varied in detail, though so similar in general outline and character, that it will require the lapse of years, and the labours of many individuals, to detect and exhibit the links which form the chain of connection in the habits and history of tribes so remotely separated . . .

EDWARD JOHN EYRE, (1845, II:152)

ALTHOUGH AUSTRALIAN 'dirt archaeology' is as old as European settlement and Governor Phillip was its first practitioner, it was long before the acceptance of stratigraphic principles brought time-depth into prehistoric reconstruction. One of the earliest discriminating observers was James Dawson, who 'dug' and correctly inferred a stratified sequence from his pot-holing in a Victorian midden.

A century elapsed after Phillip before two New South Wales fieldworkers presented accurate site descriptions or section drawings to illustrate their finds. The honour of producing the first realistic excavation report belongs to R. Etheridge. Unfortunately, his restrained account of a rock shelter excavation near Sydney in 1891, was not imitated by subsequent generations of Sydney enthusiasts, who despoiled numerous sandstone shelters. The most striking example of objective observation occurred in the north of the state, at about the same time, when E. J. Statham described and drew a section through a shell mound at Ballina. *Fig. 20*
Concluding an informed discussion, in which he drew upon Danish midden parallels, he calculated that the mound contained almost 15,000 cubic yards of oyster shell, which required 1800 years to accumulate.

The full potential of controlled excavation was first demonstrated in 1929, when Herbert Hale and Norman B. Tindale excavated the Devon Downs rock shelter, in the limestone cliffs of South Australia's Lower Murray Valley. The site was a few

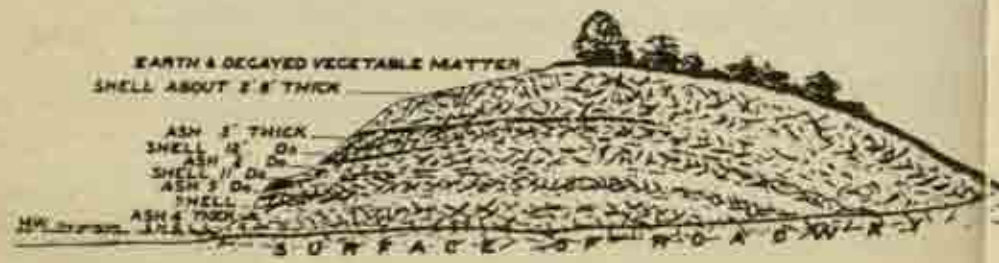
DEVON DOWNS EXCAVATION

miles downstream from Moorunde, where E. J. Eyre served as magistrate and Aboriginal Protector between 1841 and 1844. Eyre's detailed account of the inhabitants provided these and all subsequent excavators with a basic regional ethnohistorical source. Hale and Tindale completed Australia's classic excavation by promptly publishing a systematic report, which utilised the research of specialist scientists, envisaged the possibility of environmental changes since the arrival of Man, and introduced the concept of 'culture' into Australian prehistory. The memoir constitutes the point of departure for any discussion of Aboriginal antiquity.

Fig. 21

Devon Downs deposit was stratified throughout twenty feet and contained rich faunal remains, together with some 125 trimmed stone artifacts and ninety bone tools. Many years later, radiocarbon dating of samples collected during the excavation established the duration of human occupancy as greater than 4000 years. Before discussing the typology of the artifacts and listing the salient characteristics of prehistoric culture-history, it is necessary to sketch the background to the conceptual framework which developed within Australian prehistoric studies during the two decades following the Devon Downs excavation.

The Devon Downs implements were interpreted as indicating a three-fold cultural sequence of human occupation, with migrations of people providing the dynamics of change. In descending order, these cultures were termed Murundian, Mudukian and Pirman. Across the river, on the open river flats



at Tartanga, Hale and Tindale excavated a second deposit at the same time which contained implements and human skeletal remains. Although proof of stratigraphic continuity was lacking, they argued on several grounds that this deposit was older than any occupation at Devon Downs, and designated its rather meagre assemblage as the Tartangan culture.

During the following decade, Tindale drew attention to distinctive stone implement types on Kangaroo Island and adjacent mainland areas. He demonstrated that these assemblages differed from others, such as Devon Downs, and inferred that they preceded any of his four named cultural stages, with an origin back in late Pleistocene times. He termed this newly isolated entity, the Kartan culture.

CULTURE SEQUENCES

By the 1940's, therefore, South Australian prehistory was interpreted as a five-stage cultural development of great antiquity. In 1938, Tindale had joined J. B. Birdsell on the extensive fieldwork which resulted in the formulation of Birdsell's tri-hybrid theory of Australian racial origins—Oceanic Negrito (Tasmanoid), Murrayian and Carpentarian. Tindale incorporated this racial pattern into his cultural synthesis and thereafter postulated that the Kartan and Tartangan people were affiliated with Tasmanians, while his later cultures belonged to Murrayian stock.

In 1948, F. D. McCarthy published his analysis of the Lapstone Creek excavation, near Sydney. It was the occasion for a synthesis of the prehistory of eastern New South Wales, and initiated new

Fig. 20 Section through a midden at Ballina, after a drawing published by E. J. Stanbury in 1892

cultural terminology. At that time, McCarthy envisaged two phases in New South Wales prehistory, both possessing traits distinct from the South Australian sequence. The earlier phase he termed the Bondaian culture, while the immediate pre-European phase was the Eloueran culture. Subsequent excavations in the Capertee valley, near Glen Davis, led McCarthy to add a third and earlier cultural stage, the Capertian. As the result of field work in Arnhem Land during 1948, McCarthy concluded that elements of most of the South Australian and New South Wales cultures occurred in tropical latitudes, together with some local developments to which cultural labels were affixed—Milingimbian, Oenpellian and Kimberleyian.

Australian prehistorians are indebted to Tindale for emphasising the reality of ecological and cultural changes within Australia and for attempting to define their material manifestations. Current thinking of that day was tinged with an isolationist dogmatism, which negated any pattern or purpose in Aboriginal social evolution. Tindale's initiative supplied a new perspective and redirected research into the mainstream of human prehistory.

Not that many of Tindale's contemporaries appreciated these new research possibilities. Most of them would have applauded the sentiments expressed by R. W. Pulleine in 1928, only a year before the Devon Downs expedition, 'In all our stations', he pronounced with assurance in his Presidential address on the Tasmanians to an Anthropological congress, 'there is a uniformity of culture only modified by the availability of different materials for manufacture. . . . It is to be feared that excavation would be in vain, as everything points to the conclusion that they were an unchanging people, living in an unchanging environment.' Such doctrines rendered field work futile, and as many authorities shared the opinion that the Aborigines were recent arrivals within Australia, they neither anticipated nor searched for stratified deposits. It is not surprising, therefore, that the first to publicise the Devon Downs excavation overseas was an out-

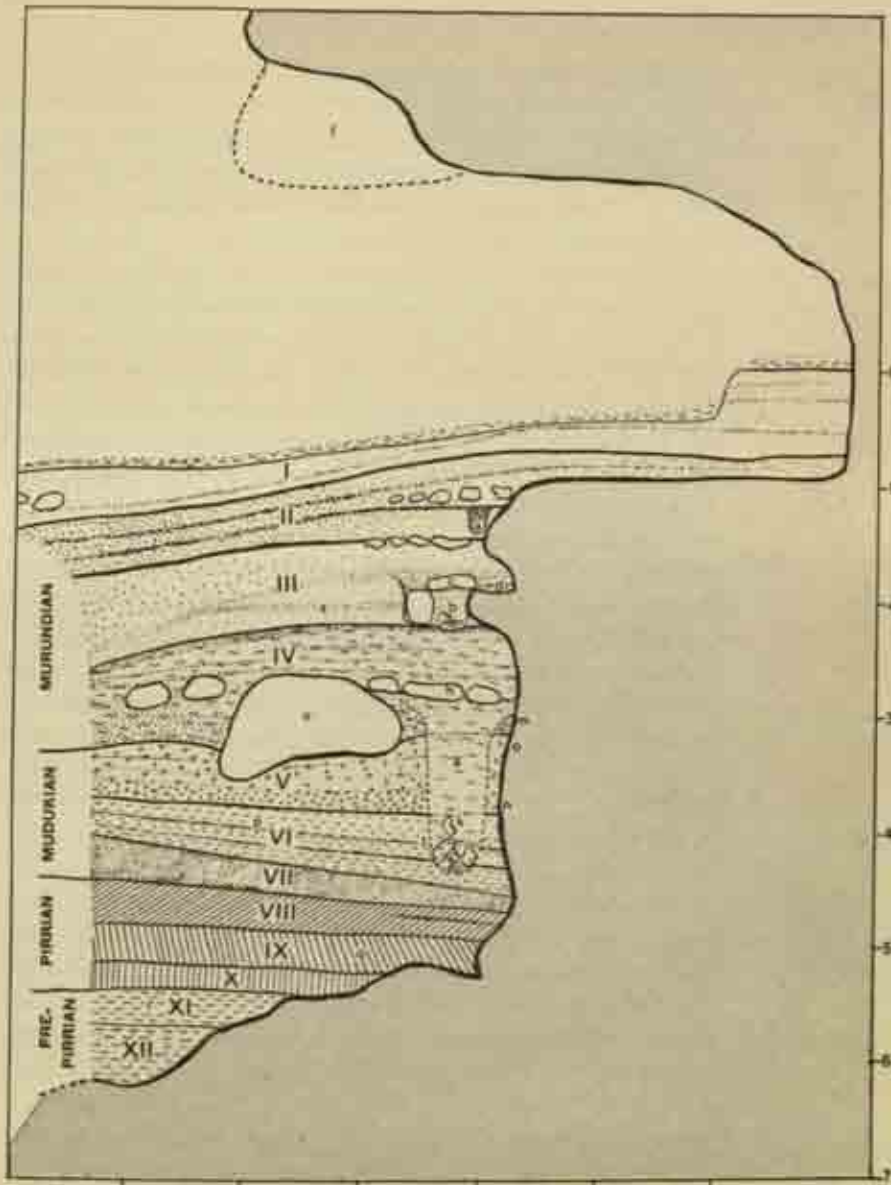


Fig. 21 The Devon Downs section drawn by Hale and Tindale in 1929 (1930, Fig. 41)

sider—the American anthropologist D. S. Davidson—who realised that the South Australian discoveries were 'proof that archaeology in Australia holds tremendous possibilities for future research'. Davidson's 1935 prediction has been validated. Yet it was 1961 before any Australian museum or university appointed a staff member whose official designation was archaeologist or prehistorian.

In later publications, Tindale employed his five classificatory cultural labels to correlate evidence, both ancient and modern, from every Australian state and even from overseas. In the face of criticism of his interpretation, he even excavated Noola shelter in the heart of McCarthy's culture-area of eastern New South Wales, and discerned a replication of the South Australian sequence. It seems today that Tindale was unduly facile in dovetailing discrete evidence from such vast dimensions of time and space, and that the Lower Murray sequence was more a rule of thumb than a yardstick for measuring the prehistory of this continent. The future may prove Tindale's intuition correct, but it is difficult to sustain the logic upon which his synthesis was structured. Detailed criticisms of Tindale's interpretation have been advanced by F. D. McCarthy and myself, and reference to relevant publications is necessary for the substantiation of the general evaluation offered here.

PROBLEMS OF TERMINOLOGY

In his earlier work McCarthy also was prone to correlate far-flung material, but he maintained a greater flexibility of approach. In recent years he had adapted his terminology to the winds of change in methodological and theoretical thinking which have blown refreshingly across the Pacific. McCarthy now proposes the terms Eastern Regional Sequence, to embrace his earlier tripartite cultural phases, and the Tula Inland Regional Sequence, which includes much of Tindale's cultural pattern; he hints at the prospect of defining a third, Northern Regional Sequence. While there is merit in a regional approach, the areas concerned are still immense and boundaries are blurred. The advisability of

naming a sequence after a single implement type is questionable, particularly as its distribution remains to be defined over much of the continent; as tula are found not far distant from the coast in South and Western Australia, the use of 'Inland' may prove misleading. Even the apparently restricted Eastern Regional Sequence breaks reasonable bounds if McCarthy's 1965 prediction is valid, that its distribution continued 'round the northern and western coasts and down to the south-western corner'.

Expressed briefly, it is my contention that although Tindale's and McCarthy's cultural concepts are understandable within the context of the period in which they were formulated, a drastic re-appraisal is necessary in the light of more sophisticated contemporary methodological practice. For example, the cultures and their component type tools were not always defined precisely and the varying systems of nomenclature resulted in confusion. Thus, Kartan was an Aboriginal linguistic-geographic term for Kangaroo Island; Tartanga was a European place name; Murundian derived from a sub-tribal division; 'muduk' was a local Aboriginal name for a fish-gorge; 'pirri' was an adaptation of a Central Australian name—pirrie—for a unifacially trimmed stone point. Likewise, McCarthy's original terms were borrowed from place or regional names, some of them Aboriginal derivatives, while specific stone implements were assigned names identical with those of the cultures of which they were type indicators. I have claimed also that the concept of culture as applied to some of these constructs was misleading. A culture should be defined from a broadly based group of distinctive, associated traits. Yet in this context, the Pirrian and Mudukian were defined initially by single material items and the Tula Sequence is similarly oriented; the Murundian was defined from ethnohistorical data and not from excavated objects at Devon Downs 'type site'; at Tartanga, distinctive tools were conspicuous by their absence. The Kartan was defined by criteria derived from a series of traits, although more stringent typological and geochronological procedures,

supported by systematic excavations, are necessary to confirm its identity. This project to define the Kartan assemblage is one of the most urgent requirements in current research.

The conceptual frameworks within which prehistoric societies may be organised are issues exercising the minds of many contemporary Pacific prehistorians, and perhaps the most incisive contributions have been Jack Golson's essays on culture change. In the light of such discussions, it is possible to evaluate the cultural systems proposed by Tindale. While he correctly emphasised the dynamic nature of Aboriginal society, he failed to allow sufficiently for regional diversity and technological adaptation. By invoking migration and racial inroads as the stimulus to culture change, Tindale accorded with contemporary archaeological practice: 'folk' bearing battle-axes or beakers are familiar travellers across the pages of older European prehistory books. Greater stress is placed today upon changes resulting from diffusion of ideas or goods, rather than mass migration, while it is realised that group adaptations to specialised conditions may produce local sub-cultures (or complexes) with an individual stamp.

ADAPTIVE PHASE

Situations described in the previous chapter are ethnohistorical examples of this kind. What happened within the prehistoric scene was that different industrial complexes developed and interacted, and these complexes constituted what some workers term 'cultures'. Because of those homogeneous factors in Aboriginal Australia which are referred to in earlier chapters, it might prove more useful if the term 'culture' was reserved for Aboriginal society as a whole. Applying American terminological practice to Australian late prehistoric conditions, an appropriate label is the Adaptive Phase of Aboriginal culture. Thus the variety of regional responses touched on above—south-eastern, south-western, New South Wales east coast, Kimberley—are industrial Aspects of this Adaptive Phase; Tindale's Murundian culture becomes its Lower Murray Aspect.

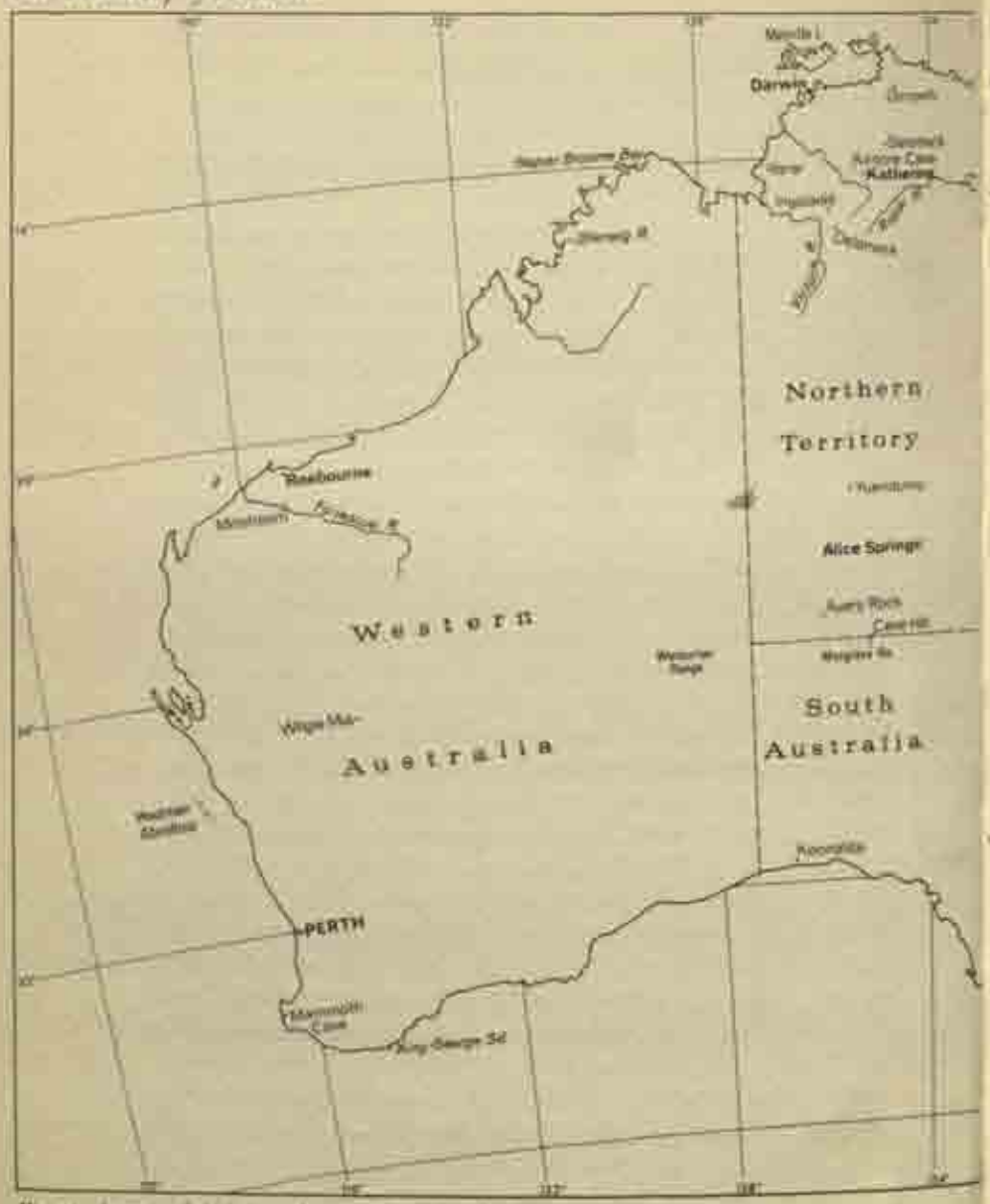
It must be stressed, however, that even where comparable facets between regional Aspects can be isolated, there is no necessity for them to have been either synchronous or homotaxial (occupying the same relative sequential positions) within a Phase, and that no firm line can be drawn for the continent, delimiting the life-span of a Phase.

With these strictures made, it becomes possible to examine the archaeological evidence. Rather than affix unduly restrictive cultural labels, it is better to isolate salient industrial complexes or technological trends. Yet prehistorians in search of significant data are aware of uneven field coverage and of the highly selective evidence which typified earlier Australian research.

INVENTIVE PHASE

If Aboriginal culture of recent centuries is designated Adaptive, the preceding six thousand years or so (using current radiocarbon estimations) might be dubbed the Inventive Phase. To my mind, the outstanding characteristics of this phase were the skill of its stone-knappers and innovations indicated by a variety of specialised tools, which contrasted with the generalised stone technology in most aspects of the Adaptive Phase. It possessed sufficient features in common to suggest that prehistorians are dealing with the ramifications of a single industrial complex, whose regional responses were yet diverse. It must be stressed that one of the striking features of this phase was the continuance of older tool traditions within the newer complex. Possibly this constitutes evidence of the adaptation of the old order to the innovations (or innovators).

This Inventive Phase witnessed the introduction and wide diffusion of tools and technologies, whose variety is best described in zoological terms. Stone tool types persisted unmodified from earlier times, but the Family of stone artifacts was further enlarged by the addition of several Genera, including points, backed blades, burins and adze-flakes; axes, apparently fossilised from an earlier age, revived and multiplied over the face of Australia. There was marked Species (or Type) and Sub-species (Sub-type) differentiation within this genetic pattern, which was



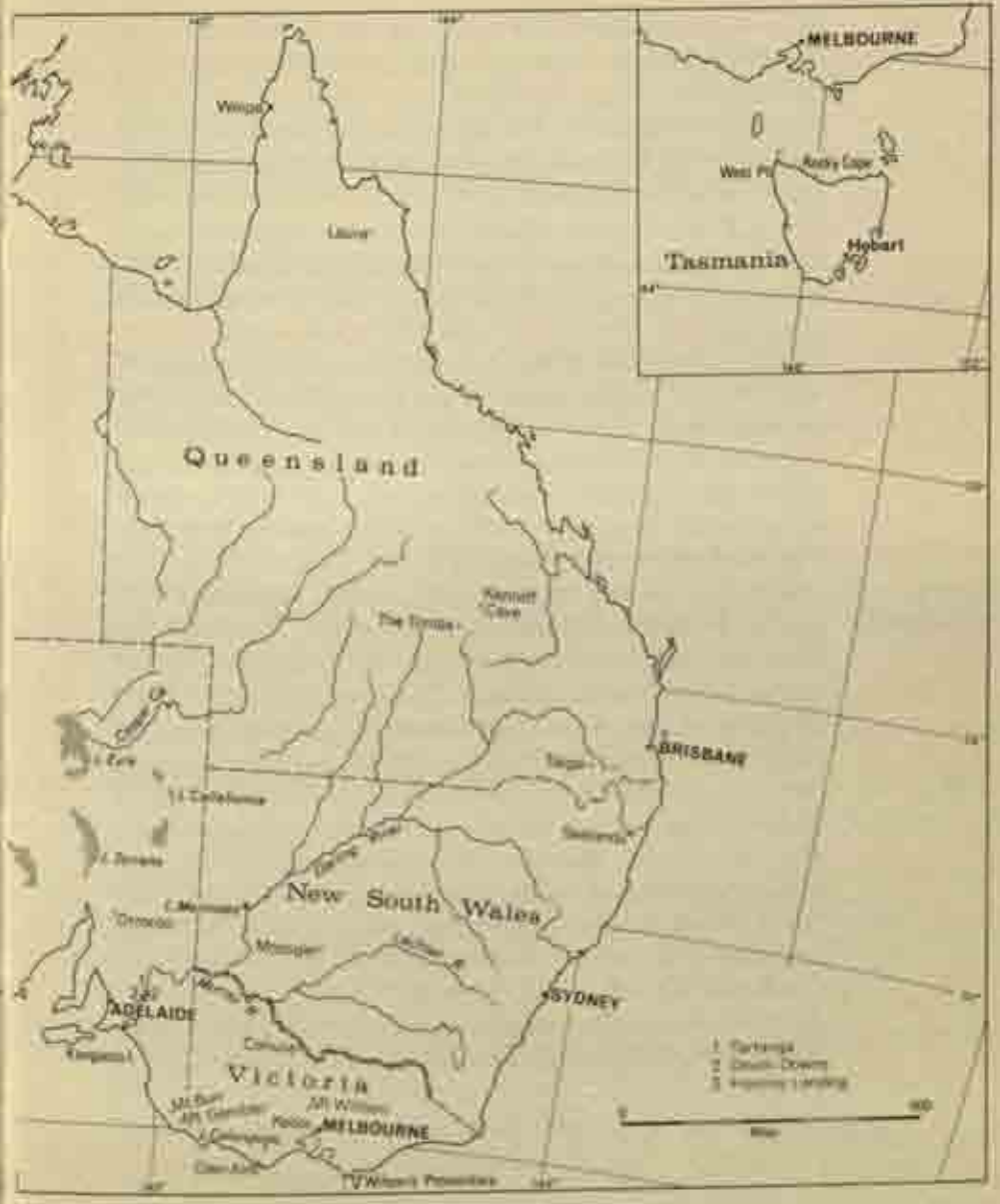


Fig. 11 Location of chief sites and towns mentioned in the text

necessarily associated with technological innovation. These included standardised flaking techniques which produced either regular pointed blades and flakes, or broad, obtuse angled, tula adze-flakes; production of slender blades also resulted in delicate fluted cores. The use of small, rectangular stone punches ('fabricators') may have become fairly general in eastern Australia during this time for stone or bone working. Stone-grinding, sometimes associated with hammer-dressing, became almost universal; pressure and delicate percussion-flaking techniques were widely adopted.

In 1965, as a result of my analysis of the Kenniff cave finds in Queensland, I suggested that this phase marked the introduction of another technological innovation—the device of hafting stone in composite tools, whereby the stone was given greater leverage, thrust or cutting power, through the use of a grip or handle. It seemed likely that many small artifacts could have become functional only by such means.

HAFTING TERMINOLOGY

Such a subjective diagnosis is incapable of positive substantiation. It is not surprising, therefore, that this division of Aboriginal prehistory into non- (or pre-) hafting and hafting phases, attracted adverse criticism. For example, there are degrees of hafting, ranging from simple hand-grips to complex handles and fastening devices, which render it difficult to define the term; *cf. Fig. 9* elementary primary flakes were demonstrably hafted in ethnohistoric times, yet such tools would escape recognition in the prehistoric record; there were edge-ground axes—presumably hafted—at Oenpelli some 20,000 years ago, long before the period which I designated as relevant. Indeed, this is possibly the earliest recorded evidence in the world for this 'advanced' technology. Yet despite these substantial objections, I believe that the concept merits serious consideration by future workers. For, whatever the explanation, there were dynamic forces at work, and it is therefore necessary to examine the evidence from individual excavations and regional distributional patterns.

During the past decade there have been many excavations within Australia, but few of them have been described in detail. Apart from my own reports on excavations at Fromm's Landing, Kenniff Cave and The Tombs, F. D. McCarthy's report on Capertee, those by Megaw and Lampert on the coastal sites at Gymea Bay and Durras North, and analyses of the groups of sites excavated in pursuance of their doctoral research by Dr Carmel White around Oenpelli, and by Dr Isabel McBryde in the New England region, no other major final reports are available. The most important relevant excavated mainland sites awaiting publication are at Laura (Queensland), Curracurrang and Noola (N.S.W.) and my own site at Ingaladdi (Northern Territory). It is therefore necessary to use preliminary information, which may require later modification. At all four of these sites, the deposits are extensive and the lower layers contain industries quite distinct from those overlying them. The implements in the upper horizons are perhaps attributable to aspects of the Inventive Phase.

KENNIFF CAVE

The Kenniff cave excavation produced a small but representative collection of most Australian prehistoric stone types in a dated stratigraphic context. Human occupation extended throughout a depth of eleven feet, with a time span reaching into the later Pleistocene. In the lower layers, all trimmed tools were made on flakes or large cores, generically described as scrapers; these are discussed below. While this tradition of scraper production persisted throughout the deposit, in layers above four feet and belonging to the past 5000 years, additional tool types made their appearance, mostly between 5000 and 2500 years ago. As their individual numbers are few, they do not possess statistical significance, yet this association of varied types within the one assemblage cannot be dismissed as meaningless.

Plate 43

It was during this later period of occupation that the first evidence both for stone-grinding processes and small blade-core production appeared. Indeed, blades were carefully backed by

bi-directional blunting retouch to produce a variety of types, including geometric microliths of crescentic and trapezoidal shape, slender, pointed Bondaian types, and chunky elouera. Points also were fashioned from obliquely trimmed bladelets, while pressure-flaking was employed in fashioning minute, symmetrical, unifacial pirri points. Several characteristic tula adze-flakes were present in this assemblage, together with a single spalled burin. An additional new type, which was introduced in the very latest occupation horizons, was the massive Juan backed blade, which ethnographic evidence indicates was hafted as a knife after the fashion of Central Australian primary blades. Useful confirmation of the validity of these associations was provided by the excavations at The Tombs rock shelter, twenty miles distant. Although their numbers were even fewer, most of the specialised Kenniff implement types were represented in layers dated to the last 4000 years, while only scrapers were present 9000 years ago.

Figs. 27, 29

Although future radiocarbon sampling is certain to produce distortion, the available carbon dates do set the Australian typological evidence into perspective (see Chronological Table on p. 180). (It is evident that while not a single estimation is available from Australia's western third, New South Wales is relatively over-represented, with over sixty dates from the New England region alone.) One of the most striking features of the chronological pattern is the fact that several types appeared virtually synchronously on widely separated sites. With the exception of edge-ground axes at Malangangerr, Nawamoyn and Tyimede II, and possibly two points at Nawamoyn, near Oenpelli, no date exceeds about 5000 years.

Kenniff cave produced a wider typological range than any other excavated site. While the assemblage of tool types in eastern New South Wales was varied, this pattern contrasts with the more restricted content of the South Australian deposits. One significant feature of the Kenniff assemblage is that it is the only

excavated site which includes all the South Australian tool types in direct association with most components of the eastern New South Wales industrial complex.

With the number of controlled excavations increasing, it is provoking to attempt distributional studies of tool types, even though restricted field surveys ensure vast blank areas on all distribution maps, while patterns remain schematic and conclusions are qualified. I first published some tentative distribution maps in 1961 and these remain basically valid today, although some areas merit firmer shading. It is salutory to remember that a find-spot often represents a solitary specimen, while because of lack of precise quantitative definition, it is possible that its typological identity is more apparent than real.

ADZE-FLAKE DISTRIBUTION *Fig. 11*

Some workers have claimed the tula-adze (chisel) as a uniquely Australian tool and it is relevant to examine the evidence for its distribution and antiquity. Tula adze-flakes were excavated both at Kenniff cave and The Tombs, but their identification is uncertain before layers dated to the second millennium B.C. It was used on Murray River sites at Devon Downs and Fromm's Landing from the third millennium B.C. If the radiocarbon age of 4070±120 B.C. (L217E) for near-by Taranga is reliable, (the sample consisted of freshwater mussel shells in a carbonate enriched environment), adze-flakes date from that time. It is not positive, however, that they were of tula type.

Burren adze-flake is to some workers an omnibus term which possibly embraces many variants and requires systematic definition, although it was observed above that McCarthy restricts its application to remnant tula adze-flakes with all or some of their distinguishing striking platforms removed. It is a matter of ethnographic observation that there was a wide morphological range in the stone initially selected for hafting on chisels and spear-throwers of non-tula type, and that their eventual treatment before discard varied. Even so, there are regions where tula flakes never occur in adze-flake assemblages, so that although tula and other

Plates 22, 23

types have partly concordant distribution patterns, the tula type is more restricted, with central continental regions as its focus. However, it extended westward to Millstream on the Fortescue River, where I. C. Glover has described their occurrence, and further field work is required to determine its Western Australian distribution.

Excavations in the Northern Territory have delimited the northern usage of tula adze-flakes, because they were unrepresented in the extensive excavations around Oenpelli, and also at Yarar on the west coast. Further inland at Sleisbeck, and in the Katherine area, they do occur. Excavations at Ingaladdi rock shelter, on Willeroo Station, have uncovered the largest stratified assemblage of adze-flakes obtained in Australia. A small test trench sunk in 1963 produced eighty tula specimens, while a larger number was found in extensive excavations during 1966. At the time of writing, these finds (estimated to number several thousand trimmed implements of all types) have not been processed. According to D. S. Davidson, who worked on Willeroo

Plate 44
Fig. 23

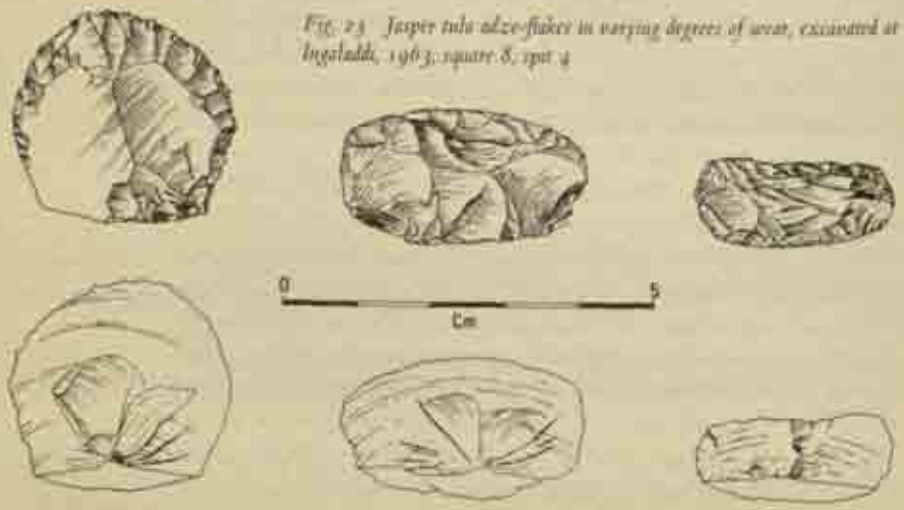


Fig. 23 Jasper tula adze-flakes in varying degrees of wear, excavated at Ingaladdi, 1963, square S, spit 4

in 1930, tula adze-flakes were not used in the area at that time; instead, pointed flakes were hafted to tula handles. Pointed adze-flakes were excavated at Ingaladdi. Davidson's observation, together with the occurrence of prehistoric specimens at Millstream, may indicate a former more extensive distribution of tula adze-flakes. There was a marked break in the nature and rate of deposition at Ingaladdi, occurring between 5000 and 5000 years ago. Preliminary sorting of the finds indicates that this hiatus witnessed a cultural change, and that the earliest adze-flakes, point industries, and edge-ground axes post-dated this break. *Fig. 12* *Plate 45*

In the light of this limited evidence it is interesting to examine the distribution map. The earliest dated tula adze-flakes were found in Lower Murray River sites; dated contexts in Queensland and the Northern Territory are younger. In New South Wales, McCarthy listed a single specimen at Capertee, site 3, in an early third millennium context, but the occurrence of one possible example in an assemblage of 2485 stone tools may be fortuitous. At least, no tula adze-flakes have been identified in other excavations on east coast or New England areas. This *prima facie* case for an inland origin therefore merits future investigation, although it is essential to determine the age of the earliest specimens in the Fortescue River area of Western Australia, which appears a potential entry point for immigrant 'tula folk'.

Remnant 'burren' adze-flakes are more widely dispersed. They occur sparsely in most east coast and New England excavations, where they date from the first millennia B.C.–A.D. R. V. S. Wright excavated specimens at Laura, on Cape York; by extrapolation from dated layers, he estimates the earliest to belong to about 1000 B.C. In South Australia, however, the type is as old as the third millennium B.C., and at Tartanga the chronology may extend back to 4000 B.C.

F. D. McCarthy and S. R. Mitchell postulated that Australian distribution patterns together with the absence overseas of close parallels for worn adze-flakes, indicated that all varieties of this

tool were locally invented. It remains true that analogues are lacking abroad for the wide-angled, tula adze-flakes. However, Bandi has described chunky obsidian flakes from Bandung, West Java, which are use-fractured or step-flaked and possibly could be classified as 'adze-flakes'. The same applies to step-flaked specimens excavated in Portuguese Timor by I. C. Glover, but this observation anticipates his definitive analysis of the finds. Step-flaked artifacts have been recovered also by Dr J. P. White in the Eastern Highlands of New Guinea, but their comparability with the Australian material is doubtful. The possibility remains, however, that future field work in tropical Australia and Island South-East Asia may yet rob the Aborigines of their presumed indigenous invention.

STONE-POINT DISTRIBUTION

Fig. 24

However, the pattern which is most likely to attract the attention of diffusionists concerns the occurrence of unifacially and bifacially trimmed stone points (most of them presumably spear-points). As the figure on the page opposite shows, unifacial points cover tropical latitudes from the north-west coast across the Northern Territory to the Gulf of Carpentaria and sweep down through the Centre to the south coast. The vagaries of diffusion and cultural preference are evident in the fortunes of bifacial points, which are restricted to the northern, tropical sector. This limited pattern is interesting, because excavations at Tyimede I and II, near Oenpelli, and at Yarar and Ingaladdi further to the south-west, have established that well-proportioned and carefully trimmed bifacial points with rounded or squared butts appeared simultaneously with unifacially trimmed points from 5000 to

Fig. 25

2000 years ago. Indeed, it seems probable that the tradition of bifacial production reached its climax at Ingaladdi between one and two thousand years ago, presumably long enough for diffusion to have carried it further south. While many of the Ingaladdi points were produced by percussion flaking, there is no reason to doubt that some were pressure-flaked. Some specimens

Fig. 26

(although mostly unifacial) possess deliberately serrated edges,

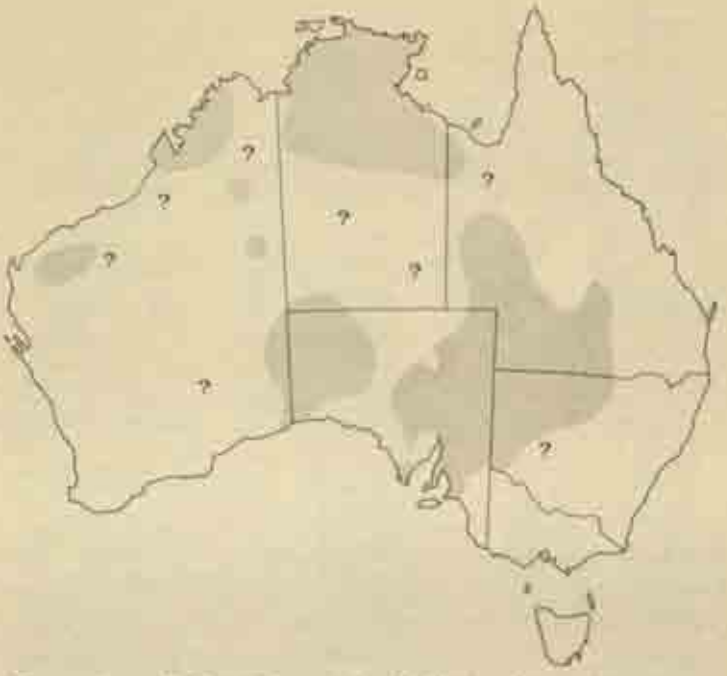


Fig. 24 A generalized distribution map of unifacially trimmed stone points

thereby proving that denticulated points were not necessarily modern innovations in the Kimberleys.

Before these excavations, D. S. Davidson, who worked on Willeroo Station within twenty miles of Ingaladdi in 1930, had postulated that bifacial techniques diffused within recent times from the Kimberley region, focus of the well-known pressure-flaked, serrated points, which in later days were made from bottle glass and telephone insulators. There is no doubt that Kimberley points were arriving there during 1930, but this is irrelevant to the origins of the technique. It now remains for excavations in the Kimberleys to determine whether there was any connection between the bifacial points in these two areas, and if so, whether the

Plate 46

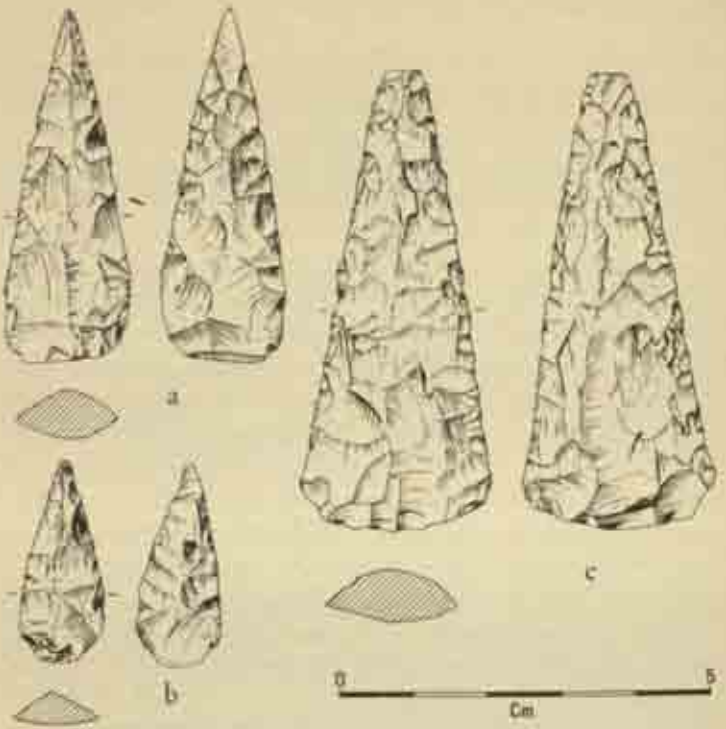


Fig. 25 Bifacially trimmed quartzite points: a, b, excavated at Ingaladdi; c, Padypadiy (near Oenpelli). L.5.3–4; level 11

influences worked in the reverse direction to that envisaged by Davidson. These recent discoveries may invalidate Tindale's earlier claim that the Kimberley biface had evolved from a unifacial ('pirrian') tradition, but at present we cannot say whether uniface or biface points have temporal priority in Australia.

The skills of unifacial point production had extended across Australia to the Murray River by the third millennium BC, perhaps 2000 years after their earliest dated appearance at Nawamoyn, near Oenpelli, on the north coast (ANU-53, 5,160±130 BC); as only two specimens were recovered, however, they may have moved downwards through human or animal agency.

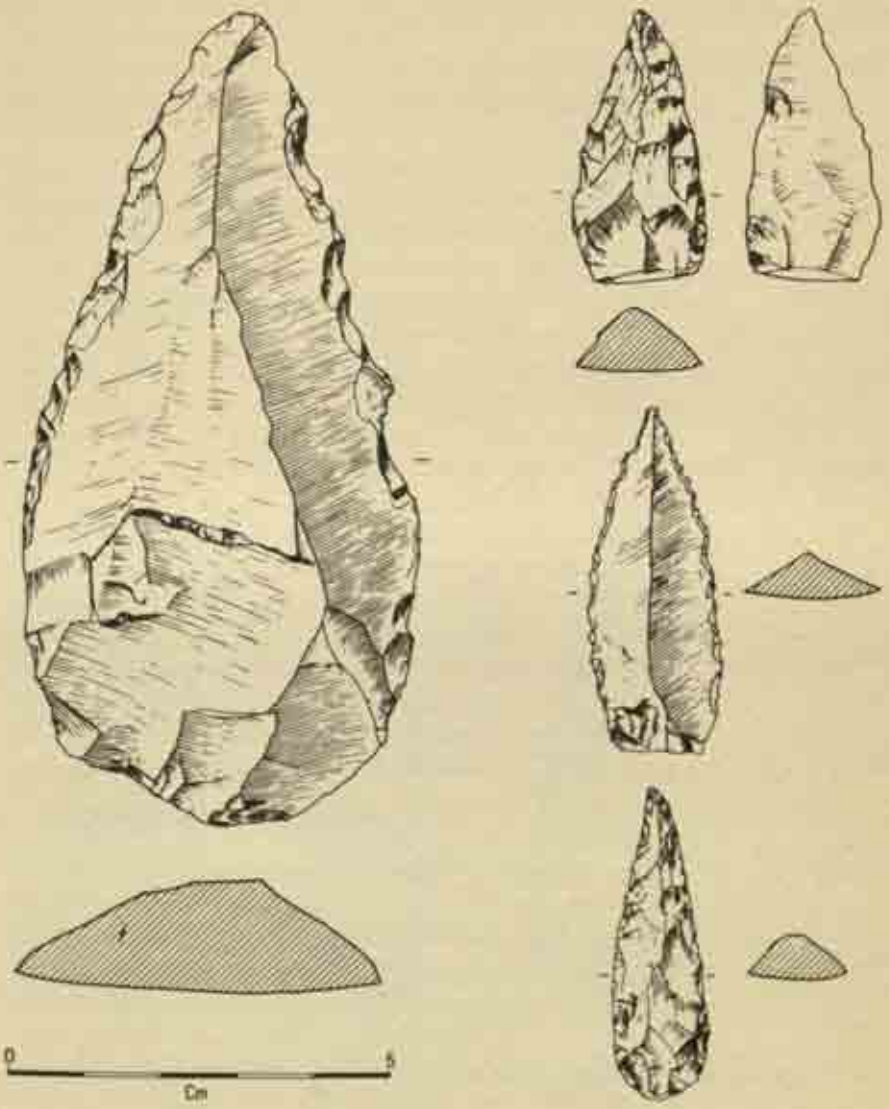


Fig. 26 Unifacially trimmed quartzite points excavated in upper layers at Ingoladdi, 1963; centre right is serrated.

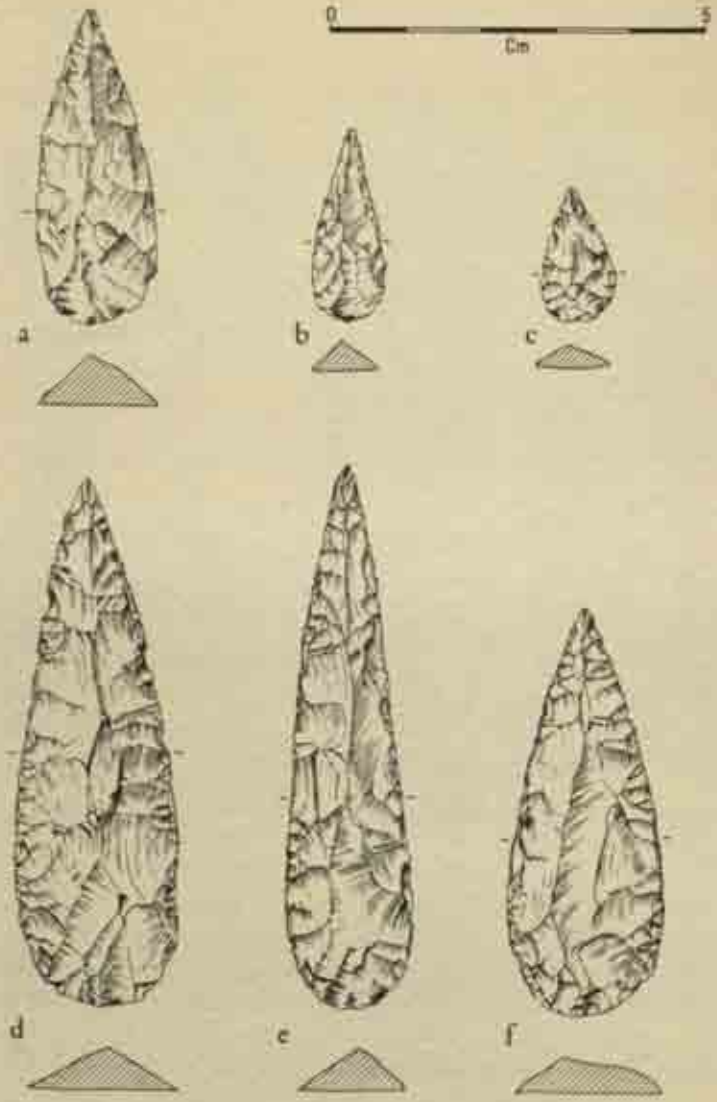


Fig. 27 Unifacially trimmed pirri points: a, b, Adelaide area, South Australia; c, The Tombs, Queensland (NPL-31: 1650±93 BC); d–f, Mulka, South Australia

Recent excavations in the Northern Territory have demonstrated that there were diverse ways of treating unifacial points, but that the earliest specimens are similar in size and proportions to the associated bifacial points. The long, massive points characteristic of many ethnographic specimens, have few parallels in the earlier excavated record. For example, they were absent from the Yarar assemblage, which contained 1278 smaller, unbroken unifacial and bifacial points. Preliminary sorting of the Ingaladdi material suggests that this large type was a gradual introduction during the later occupation of that site. Whether it was related to the shovel-nosed spear of the Arnhem Land Coast (itself a stone replica of a metal Macassan introduction?) remains to be investigated. Fig. 26

PIRRI POINTS

The uniface pirri points excavated at Devon Downs and Fromm's Landing were characterised also by varying degrees of finishing retouch, including pressure flaking, but all of them are reminiscent of prehistoric Northern Territory points. Perhaps one distinguishing feature between northern and southern points is that while the butt end is usually unmodified in the north, it is commonly (though not necessarily) trimmed and thinned on southern specimens. Indeed, there are examples of bifacial treatment of the butt, apparently to remove the bulbar thickening and so ensure a thin cross-section. This trimming is so restricted and functionally oriented, that despite such artifacts being technically biface points, it is not unduly contradictory to class them with orthodox, unifacially trimmed pirris. This illumines a problem facing Australian typologists, however, that ideal types are rarer than their variant or anomalous forms. Yet, despite sub-typical (or sub-species) variation, it is useful to classify generic types (or species) in order to evaluate prehistoric societies at a general level of technological (or cultural) development. *Fig. 27*

Sophisticated quantitative investigation of excavated point-industries at Yarar and in the Oenpelli district have been completed both by Mrs J. M. Flood and Dr Carmel White, but no comparable studies have been attempted further south. There is

need for closer analysis of the pirri-point industry, for while the pirri is one of the most distinctive implements of antiquity, it has been one of the most ill-defined. The fault lay partly with those who used the term loosely as a synonym for any pointed flake (and therefore located the type almost everywhere), and with others who defined the type restrictively by reference to the borders of South Australia (not surprisingly, those responsible were South Australians). A realistic definition must relate to proportion and symmetry, in addition to absolute measurements; and the consummate skill required to remove minute flakes either by pressure or percussion produced artifacts with aesthetic overtones which were surely beyond the demands of mere function.

T. D. Campbell, a protagonist of local development, defined the 'typical' South Australian pirri of the Lake Eyre region as averaging about four cm. in length, with a width about a third this *Fig. 27* dimension, although specimens up to nine cm. long are known. He found that there was also a smaller, stouter variant (the Fulham pirri) in more southern areas, and he inferred that size diminished also to the east of Lake Eyre. This size variation is confirmed, but it extends well beyond state confines. Tiny, but superbly trimmed points (some pressure-flaked), were excavated in Queensland at Kenniff cave and The Tombs in third and second millennium *Fig. 27c* BC contexts. Pirris have been excavated in the Northern Territory, but their size range is from medium to small, and variations in finishing retouch are particularly common. Analysis of the Ingaladdi points may quantify the problem.

So many pirri points are small, that some workers believe that they were unsuited as spear-heads, while close examination of their tips fails to reveal the wear necessary to validate their use as drills. (This latter was a localised, secondary re-use observed in recent times). If found overseas, many pirris would be described as arrow-heads, but despite this attractive hypothesis, there is no evidence that the Australians either possessed the bow or had lost the art of archery. It is a matter of observation that museum

Fig. 28 A generalized distribution map of geometric microliths

collections possess some stone-tipped spears, including Kimberley bifacial points, which are surprisingly small and whose tips project less than two cm. from their adhesive. Possibly the size misleads, as diminutiveness does not necessitate fragility; small tips might prove more practical than long, slender ones. Possibly also, it was a matter of balance, in which the relatively large resinous matrix was an essential element. Prestige is another relevant factor: it may have been as praiseworthy to use a 'craft-built' small tip, as it was to employ pretentious large ones, which shattered upon impact.

cf. Plate 46a

MICROLITHIC BLADES

Australian microlithic blade industries plot intriguing distributional patterns, with concentrations in the south-east. The

Fig. 28 most northerly excavated specimens of both geometric and asymmetrically backed (Bondaian) types were recovered at Kenniff

Fig. 29 cave and adjacent Carnarvon Gorge. Despite recent intensive field work in the Northern Territory's Top End, no specimens have been identified there, and they are absent also in the Laura region of Cape York, the only sector of that northern extremity so far investigated. Indeed, there is no reliable record of their occurrence far north of the Tropic of Capricorn, while the largest collection from within the tropics was made at Millstream half a century ago, on the Fortescue River, Western Australia. This important assemblage has been analysed by I. C. Glover, who determined that both geometric and Bondaian variants were present, together with tula adze-flakes. He found that there was a remarkable morphological and technological similarity between these backed blades and collections from the Sydney region, right across the continent.

The sporadic occurrence of find spots on the West Australian landscape is best explained by restricted survey, and is sufficiently consistent to hint at a cultural continuum stretching across to Lake Eyre and the south-east, which is the focus of geometric microlith distribution. (20,000 specimens were collected in a restricted area west of Lake Torrens.) While Bondaian types also occur in South Australia and Victoria, there was an extraordinary concentration on coastal sites in southern New South Wales, and thousands of carefully trimmed specimens are dispersed widely through private and museum collections. J. V. S.

Plate 47 Megaw's excavation of the sandstone shelter at Curracurrang produced over 1000 backed blades in stratigraphic context and their analysis should contribute substantially to an objective appraisal of the problem.

It is evident that while Bondaian variants show a coastal tendency in their occurrence this may result from inadequate field knowledge. For example, they were present in the Great Dividing Range at Kenniff and The Tombs, and Dr McBryde has

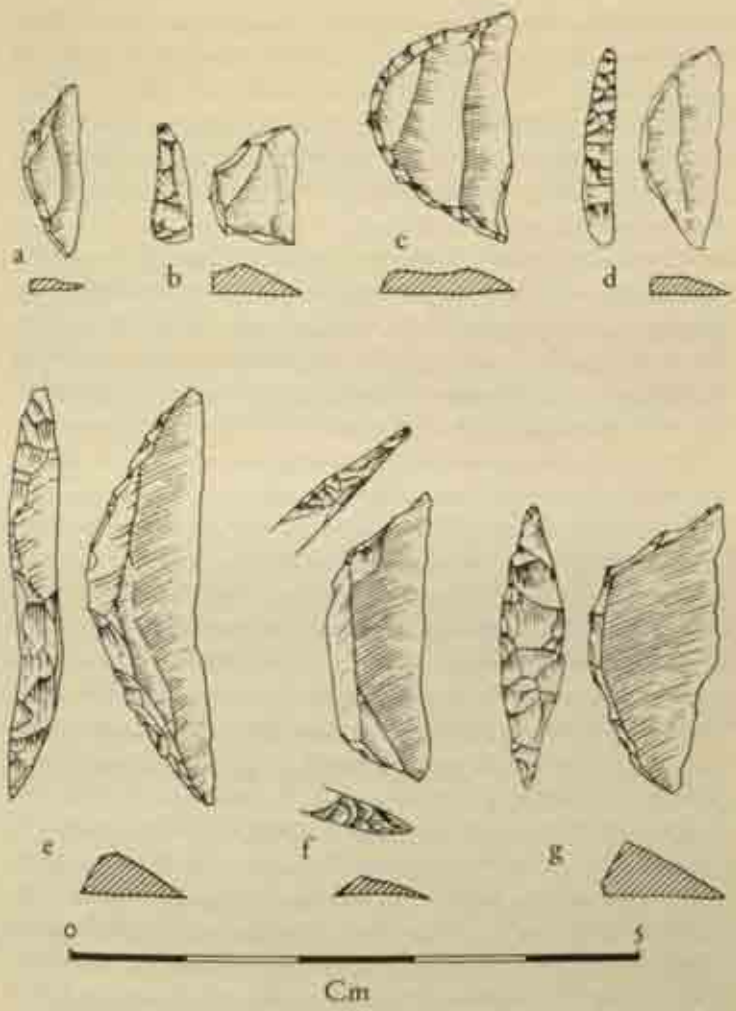


Fig. 29 Geometric microliths: a, d, Kenniff cave, Queensland, layer 10, 1964 (between 2000 and 4000 years ago); b, Anakie, Victoria, c, Pialago, A.C.T.; e, Kenniff cave, layer 9 (NPL-32: 2550± 90 BP); f, Inverleigh, Victoria; g, Golden, South Australia

collected them near Milparinka, in the extreme north-west of New South Wales. It may be claimed, therefore, that subject to regional variations the distribution of all microlithic types is roughly concordant; more precise definition awaits field survey. It is interesting that unifacial point distribution overlaps this complex in south-central Australia; at Fromm's Landing, The Tombs and Kenniff cave, pirri points and microlithic tools were associated in the same layers. On the other hand, there are no pirri points in Victoria, classic area of geometric microlith production; they are lacking also in many Bondaian contexts in New South Wales. Pirris and microliths therefore cannot be envisaged as components of the same composite tools. Similarly, although it is possible that Bondaian and geometric forms were associated on single tools in eastern coastal areas, this possibility is excluded in areas of exclusive geometric representation.

Evidence is accumulating to establish that in prehistoric times backed blades were hafted, perhaps either as projectile tips and barbs, or set in series as saw-knife blades, with the blunted back embedded in the adhesive. Informative specimens with traces of the resin preserved have been excavated at Fromm's Landing and at Graman (where the implements are more than 2000 years old). It is recorded in recent times that geometric microliths were held between thumb and forefinger during human blood-letting and scarifying ceremonies, but in such instances there are indications that these were simply re-used, discarded prehistoric tools; surface scatters of microliths are as visible to recent Aborigines as to avid cabinet collectors.

Plate 48

The oldest dated backed blades were recovered at Graman, where both geometric and Bondaian forms belong to the fourth millennium B.C. and a comparable antiquity seems possible at Wilson's Promontory, Victoria. Their most recent occurrence centres around A.D. 1600, at the New England sites of Bendemeer and Seelands and at Mt Burr, South Australia. A large cluster of dates from New South Wales sites establishes the apogee of backed

blade production between the third millennium BC and the first millennium AD, and the evidence from South Australia is consistent with this chronology. However, as their distribution spans the continent, Western Australia is a crucial region for diffusionist speculation. While the oldest evidence is eastern, and this is possibly the region where microlithic techniques matured, the western coast may have received the earliest technicians. The Fortescue River–Millstream area offers attractive prospects for future field work, where excavations and radiocarbon dates must test this hypothesis, and establish whether geometric and Bondaian forms developed independently or were diffused.

OVERSEAS PARALLELS

The similarity between microlithic tools both within Australia and overseas is so marked, that it is easier to accept a theory of outside origins than to postulate independent invention. Unlike some European specimens, however, the micro-burin technique was not employed, and the implement was made on a complete blade or bladelet, not upon fragments of one long blade. The geographically closest parallels are the undated assemblages of fine blade tools in south-western Celebes and western Java. In these areas, various forms of backed blade, comparable in dimensions and morphology to those of prehistoric Australia, possibly were associated with unifacial point industries. These similarities are so visually apparent that some commentators have taken them as typologically real, and applied Australian nomenclature to Indonesian assemblages. Such practices are premature, pending Indonesian field work to establish stratigraphy and associations, allied with quantitative artifactual analysis. It is a speculative hypothesis that both point and microlithic blade industries had differentiated before reaching Australia, although diversification continued here, and that while Arnhem Land was the likely beachhead for the former technology, north-western Australia was the possible entry area for the latter.

It seems valid to observe of the eloueta, whose functional aspects were discussed in chapter 3, that its cultural significance

has become uncertain with the passage of time. It seemed clear-cut in 1948, when McCarthy published his Lapstone Creek memoir. A basic typological differentiation was evident between the lower deposit, which contained 186 Bondi-points and only six elouera, and the upper deposit where backed blades were absent entirely, but seventy-three elouera were present. Not unreasonably, McCarthy argued from this evidence to the reality of a dual cultural sequence in eastern New South Wales, termed Bondaian and Eloueran.

Subsequent excavations have failed to produce such a pattern of mutual exclusiveness, although they provide general confirmation of this interpretation for the Sydney region. For example, at Curracurrang, although elouera and backed blades co-exist to a greater extent than at Lapstone Creek, a preliminary calculation of the proportion of elouera to other backed blades, between middle and upper layers, shows that it rose from 18 to 45 per cent. Using radiocarbon estimations, it could be argued in support of this thesis that, if Capertee Site 3 was abandoned more than 4000 years ago, this may explain the occurrence of 318 Bondi points and only seven elouera. Conversely, however, analysis of finds from two sites dated to the last millennium provided only meagre support for any presumed Eloueran phase—Gymea Bay produced a single elouera, while Durras North contained two.

Several prehistorians also feel that there are problems concerning the quantitative definition of the Eloueran type. It seems hazardous to correlate scattered specimens from far-flung regions until field research establishes the validity of their identification. Others have misgivings about classifying the Oenpelli specimens with those from New South Wales, despite the morphological similarity of a proportion of the tools; at present also, the gap in distribution between southern Queensland and Oenpelli requires bridging. More fundamental is the issue of drawing bounds between variants and gradations in the genus backed blade. I drew attention to this problem at Kenniff cave, when describing

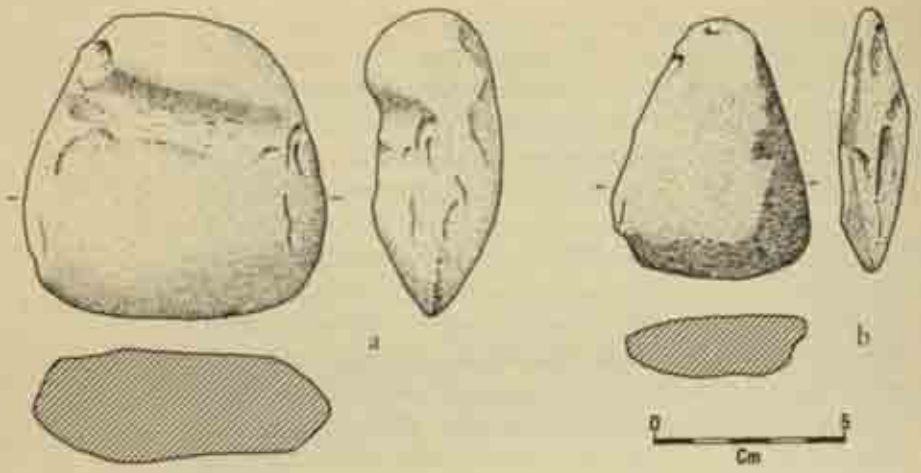
a minute geometric microlith and a large one of identical form, which might have been easily designated a thin elouera. The Curracurrang excavation high-lighted this classificatory problem, which is under examination by I. C. Glover and J. V. S. Megaw, and their final evaluation is awaited. *Fig. 39a, c*

A further difficulty is chronological. At Lapstone Creek site, which was radiocarbon-dated thirty years after its excavation, the Bondaian climax occurred by 1700± 100 BC (ANU 10), while all trace of Bondaian points had disappeared by 350± 100 BC (ANU 11). Yet such an early decline in the fortunes of this type was unusual, as results from Curracurrang, the Hunter River valley and New England, dating into the second millennium AD, demonstrate. These and other excavations indicate further that elouera were either earlier than, or contemporary with, the first appearance on many sites of various forms of backed blade. Accepting current identifications at face value, elouera were present in South Australia and Queensland around 4000 years ago, and even earlier at Graman, in New England (GaK-805, 2690± 100 BC).

Divisions of time, space and typology of elouera are blurred, and it is necessary to await clarification from detailed site assessments. Curracurrang promises basic data, but important evidence is also forthcoming in reports of their excavations by R. V. S. Wright both at Smith's Creek, north of Sydney, and at Laura, Queensland, by D. R. Moore in the Hunter River area, and by R. J. Lampert at Burrill Lake, south of Sydney.

BURINS

In addition to the general adoption of a variety of adzes, points and backed blades, other specialised stone tools which characterised Aboriginal culture during the past few millennia included burins and edge-ground axes. Burins, like fabricators, received recognition in the Sydney area earlier than elsewhere. There are grounds for believing that this is because the type is concentrated in eastern New South Wales, but it may also result from a failure by stone-collectors elsewhere to identify the tool. S. R. Mitchell



omitted all reference to it in his classificatory survey, and he was representative of the Victorian school of collectors. In my 1961 survey of the evidence, I expressed reservations, which must be withdrawn in the light of accumulated evidence. Burins, which are classifiable under Old World norms, have been excavated in stratified contexts in New England and at Capertee, Curra-curtang, Cymea Bay and upon other east coast sites; there was a single specimen at Kenniff cave. The earliest dated appearance of the type is possibly during the third or early second millennium B.C. Burins are present in the upper Ingaladdi assemblage.

GROUND AXES

Except for the surprisingly early Pleistocene occurrence of pecked and edge-ground axes at the Malangangerr, Nawamoyn and Tyimede II shelters, near Oenpelli, and their apparent persistence throughout the prehistory of these sites, the earliest date for these techniques on all other Australian sites is third millennium B.C., around which period the knowledge seems to have diffused widely and rapidly. Highly developed grinding techniques appeared in New Guinea in near-Pleistocene contexts, so the Oenpelli occurrence was not unique despite its apparent

Fig. 30

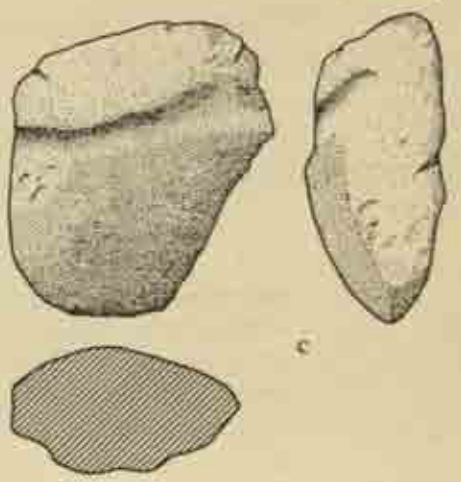


Fig. 30 Pleistocene edge ground axes from Ocupelli area. a, Malangangerr: hornfels, grooved on one surface. 2A/7-428, level IIIb (c. 19,000–23,000 BP); b, Nawamoyn: hornfels. E11/9-1, level IIIb (ANU-51: 21,450±380 BP); c, Nawamoyn: porphyrite dolerite, with horizontal groove J1/7-8, level IIIb

failure to influence Australian technology and to penetrate the hinterland at this early period. There is need of detailed research upon axe typology, distribution and sources of stone within Australia. It is rare for axes to have been ground all over, and polished forms, so common in Melanesia, are virtually unrecorded. Axes were first shaped by flaking, and then the cutting edge was ground. In addition, over most of northern Australia and in eastern areas, hammer-dressing (pecking) was sometimes used to shape the flaked-axe blank or selected pebble.

Amongst the most interesting variants are large pecked and grooved axes or pounders of south-eastern Australia. Victorian specimens are known with one or two encircling grooves and one or more median or diagonal grooves which extend round the butt end to join the encircling grooves. Although presumably designed as a hafting device, there are no reliable records of ethnographic specimens so hafted, so the type is truly prehistoric. Another unusual feature of these prehistoric specimens is their size and weight: some weigh several pounds. It is interesting that of the Pleistocene axes excavated by Dr Carmel White near

Fig. 30

Oenpelli some seem to be grooved or waisted. It is worth reflecting that while Polynesian adze-typology has attracted specialist attention for many years, the equivalent research in Australia has scarcely commenced. It is evident that there are marked regional variations in the size, shape and degree of finish on axe-heads, but classificatory research on museum collections remains for future study.

It is difficult to assess the significance of the stone implements and technologies of the Inventive Phase of Aboriginal culture. The introduction of new tools enriched material culture; it is evident that the new devices encouraged considerable regional flexibility in design. Whether it permitted greater control over the environment is conjectural. However, compared with the Tasmanians encountered by European settlers, who lacked these more sophisticated tools, it would seem that the lot of the mainlander should have been a more efficient one. In addition to lacking all varieties of axes, adzes, saw-knives and stone-tipped spears, the latter-day Tasmanians knew nothing of boomerangs or spear-throwers. Does this mean that these archaeologically perishable wooden tools also were first introduced into Australia during the Inventive Phase and never penetrated Tasmania? Even if such speculations are invalid, the mainland tool-kit was more complex after perhaps 3000 B C than previously, possibly allowing those who possessed it to exploit their environment more efficiently than the 'have-nots'. Perhaps the situation was comparable to the arrival of *Homo sapiens* in Pleistocene Europe, when he supplanted *Homo neanderthalensis*. In both instances the rate of technological innovation and diffusion was relatively rapid; possibly it terminated Stages in the cultural development of these continents (to borrow American phraseology), with drastic effects upon the older cultural order. Yet in Australia, the persistence of earlier flake, core and pebble traditions into the Inventive and Adaptive Phases, perhaps implies that the innovations (or innovators) were assimilated by the original population.

CHAPTER V

Aboriginal Origins

Their origin, like that of most things in creation is involved in impenetrable obscurity.
P. E. DE STRZELECKI, *Physical Description of New South Wales and Van Diemen's Land* (1845:333)

TASMANIANS ARE known to have been established in their island for well over 8000 years; presumably they had arrived dry-shod, and were isolated by the eustatic sea-level rise which drowned Bass Strait 10,000 or 11,000 years ago. Before examining the mainland situation during the long period between Man's initial arrival down to the Inventive Phase, it is relevant to consider the Tasmanian evidence.

TASMANIAN MATERIAL CULTURE

When first encountered by Europeans, Tasmanian material culture appeared so rudimentary that evolutionary theorists later judged it a storehouse of fossil facts. Edward Tylor dubbed Tasmanians the 'representatives of Palaeolithic Man'; John Lubbock impliedly denied their humanity with his mechanistic aphorism: 'The Van Diemener and the South American are to the antiquary what the opossum and sloth are to the geologist.' The Tasmanian tool-kit lacked such typical Australian items as the spear-thrower, boomerang, shield, axe and adze, and included no composite hafted tools to supplement simple wooden spears and clubs. Stone tools apparently consisted of hand-grasped flakes, cores or pebbles, and although these reflect skilful shaping and retouching, techniques of grinding, delicate blade production and pressure-flaking were unknown. Tasmanians lacked the company of dingoes, but evidently not by choice. European dogs were assimilated into their hunting economy with such rapidity that by 1830 they were as ubiquitous and numerous as in mainland Aboriginal camps. As early as 1839, the explorer Sir Thomas Mitchell argued cogently that the Aborigines had reached Tas-

mania before the formation of Bass Strait, but before dingoes arrived to cross by the same means.

Opinions concerning Tasmanian origins have fluctuated during the past century, and elsewhere I classified them broadly into 'overlanders' and 'drifters'. Proponents of the view that Tasmanians originally occupied Australia generally agreed that Tasmanian evidence was an ethnographic reflection of initial Australian culture. Opponents claimed a dearth of positive evidence for any cultural connection and preferred that the Tasmanians should drift or coast from some area of Oceanic Negrito influence, usually New Caledonia. Despite engendered heat, there was small light output. The basic deficiencies were archaeological data, from Melanesia and Australia no less than from Tasmania. N. B. Tindale collected some interesting evidence and offered far-reaching correlations, but although later research may establish the validity of his intuition, they must be described as premature in the context of his times.

Only Tasmanian excavations can determine whether Aboriginal material culture persisted throughout Tasmanian prehistory without substantial alteration, while detailed typological comparison is essential between the earliest stone implements and those of comparable antiquity on the mainland, in order to establish whether they possess cultural affinity. It was not until 1963, when Rhys Jones commenced a series of excavations in north-western Tasmania, that stratigraphic time-depth was introduced. His chief sites are two caves at Rocky Cape and another at Sisters' Creek, and the extensive middens on West Point; but only interim research reports are available. Several radiocarbon estimations obtained by G. Reber, for samples from widely dispersed middens and at Rocky Cape South cave, were collected before Jones commenced research.

STRATIGRAPHIC EVIDENCE

Rocky Cape South cave proved to be one of the most important sites excavated in Australia. It was dug extensively by earlier workers, resulting in the removal of the uppermost occupation

layers and some disturbance elsewhere. Even so, it constitutes an immense, roofed shell midden, still over ten feet thick, well stratified, and rich in stone and bone remains; charcoal a foot above the base was dated to 6170± 160 BC, while the topmost surviving stratum was 1845± 100 BC (V-83). The accidental discovery of a low cavity, sealed when deposit accumulated in front of it, enabled Jones to extend excavations during 1967 into this zone. It offered a unique experiment in Australian research, because its surface, littered with shell and bone refuse, camp fire debris and discarded stone tools, had remained intact since the last occupants abandoned these cramped quarters. To judge from the age of the layer which sealed it, this was about 4000 years ago. Plate 50

Preliminary analysis by Jones indicates that the site separates into two major occupational phases. The lower six feet was rich in faunal remains and should permit sophisticated dietary calculations. A number of well-made bone points and spatulae of wallaby fibulae testify to a bone-working tradition. At this period, stone supplies were local, and tools consisted of relatively undifferentiated retouched flakes and unifacially flaked pebbles; two large alternately flaked cores had been used later as tools.

The top four feet, beginning some 5000 years ago, was poorer in faunal content and no bone tools were found, but stone artifacts were plentiful, including many tiny flakes. Fine-grained stone, of which up to five per cent was obtained from relatively distant quarries, supplemented local sources. To the continued tradition of simple retouched flakes, this occupation added small, carefully trimmed, high-domed flakes with concave edges, and others with steep, step-flaked lateral retouch.

Although Rocky Cape North cave deposit was stratified for nine feet, Jones correlates only the bottom two feet with the early occupation at South Cave, 1000 yards away, and this is confirmed by dates ranging from 3475± 135 BC to 1480± 95 BC (V-89, 88). Only one bone tool was present, while these oldest stone artifacts were few and generalised. However, in the top seven feet

continuing to A.D. 1500±105 (V-87), there were no bone implements but stones were numerous and diagnostic. Increasing use was made of imported raw materials, while small, rounded, concave implements were manufactured, similar to those at South Cave. Amongst other retouched flakes were flat, circular scrapers; there was utilisation fracture on small, disc-like, alternately flaked cores.

Sisters' Creek site, only seven miles east, was stratified for five feet and its basal occupation dated from 4100±88 B.C. (N.S.W. 17). The evidence was comparable with the upper levels at Rocky Cape, in that some stone supplies were imported, while alternately flaked cores and small, domed, steeply retouched and concave types were represented. In addition, there was a range of secondary trimmed flakes, some step-flaked, together with unifacially and bifacially flaked pebbles.

The West Point midden is one of a vast complex between Cape Grim and Sandy Cape, which evidently served as a focus for prehistoric occupation. Excavation established that the shell- and bone-packed midden was eight feet in depth, this occupation spanning about six centuries, from the first century A.D. Jones obtained the largest excavated faunal assemblage—over 20,000 bones—in Australia, and its analysis should contribute an invaluable ecological study. Despite this plethora of bone, only a few pieces had been utilised, thereby providing additional proof that bone tool production belonged to the earlier stage of north-western Tasmanian prehistory. Possibly from five to eight per cent of the 30,000 excavated stone artifacts bore some retouch, and these included a variety of scrapers, comparable with the flake tools from the upper levels of the cave sites.

Plate 49

There was obviously a measure of agreement in the nature of the evidence at all sites. As Jones' excavations were extensive, it is likely that they provided a representative sample of Tasmanian prehistory, at least in its north-western aspect, and they have wider implications. The stone types have close parallels with surface

finds in other parts of Tasmania; they are in keeping also with scattered and generalised comments on implements used during terminal protohistoric days. However, work initiated in the south-east by H. Lourandos should assist a wider evaluation of assemblages loosely termed 'Tasmanian', and should test Jones' hypothesis that the earliest Rocky Cape South industry was cruder than contemporary ones elsewhere.

ECOLOGICAL INFERENCE

Jones infers that settlement patterns in his region showed increasing familiarity with resources available and adaptation to environmental conditions. Industrial changes occurred with time, both in the declining bone industry and in the increasing mastery of stone-knapping, although he questions whether the early Rocky Cape South assemblage was totally representative of Tasmanian tool-kits everywhere at that time. Dietary changes are reflected in the bones of fish, marine and land animals, and molluscan remains, but these must still be analysed. Some shifts evidently resulted from changing food preferences, particularly the astonishing fact (supported ethnographically) that fish was not eaten in later prehistoric Tasmania, although a basic commodity earlier. Other changes were necessary adjustments to natural or human influences, such as the virtual local extinction 1000 years ago of the chief food animal, the Southern Elephant Seal (*Mirounga leonina*), possibly due to Aboriginal hunting activities. The increasing importance of land marsupials and sea birds in the later days of Rocky Cape North, may be a reflection of the declining seal population; it may also indicate a more effective exploitation of a wider range of protein supplies.

These discoveries establish the reality of temporal change and increase the probability of discerning regional variations in the pattern of Tasmanian culture. They also high-light an underlying cultural similarity or homogeneity, which is more than a mere inheritance common to all hunter-fisher-gatherers. While alterations in material culture developed from within that society, its industrial continuity is more striking than these changes;

there is no hint of diffusion of techniques or ideas from outside. If the absence of dingoes may be explained by lack of mainland contacts, so also may the excavated artifactual record. In 6000 B C, Tasmanian stone tools were made on flakes and pebbles, and are best described typologically as 'scrapers' and 'choppers'. Scrapers perhaps became more elaborate by 3000 B C—concavities, noses, step-flaked re-sharpening, finer flaking on superior stone—but in A D 1800 the tool-kit still comprised comparable scraping and chopping tools. All available ethnographic data support Brough Smyth's observation that 'these stone implements are all of one character; none of them were provided with a handle.'

In countering my published interpretation, Jones emphasises that there are no objective criteria whereby unhafted stone tools may be recognised in the excavated record; only hafted specimens can be positively identified when adhesives are preserved. While accepting the logic of this observation, it yet seems that the Tasmanian evidence is so consistently 'non-hafted' that the onus rests with those possessing misgivings, to recover positive proof that hafting techniques were practised.

It is possible to review the vexatious problem of Tasmanian origins in the knowledge of excavated evidence. Their racial affiliations remain speculative in the absence of skeletal remains in early contexts. However, the discovery of cremated bones in the West Point midden extends the practice of cremation back from 1829, when it was described in detail by G. A. Robinson, for perhaps 2000 years.

Rocky Cape was occupied over 8000 years ago. This is unlikely to be the earliest evidence, because it would be a coincidence if the site investigated first by archaeologists was that chosen also by the first band of Tasmanian colonists. Jones argues cogently that their original camp-sites lie beneath the waters of Bass Strait, and that they avoided the more inhospitable hinterland until necessity drove them there. In any case, during late glacial times, settlement might be anticipated nearer the more

congenial eastern coast. Evidence shows that in the western region, the snow-line was lower and ice sheets survived longest; today it is wetter.

TASMANIAN ORIGINS

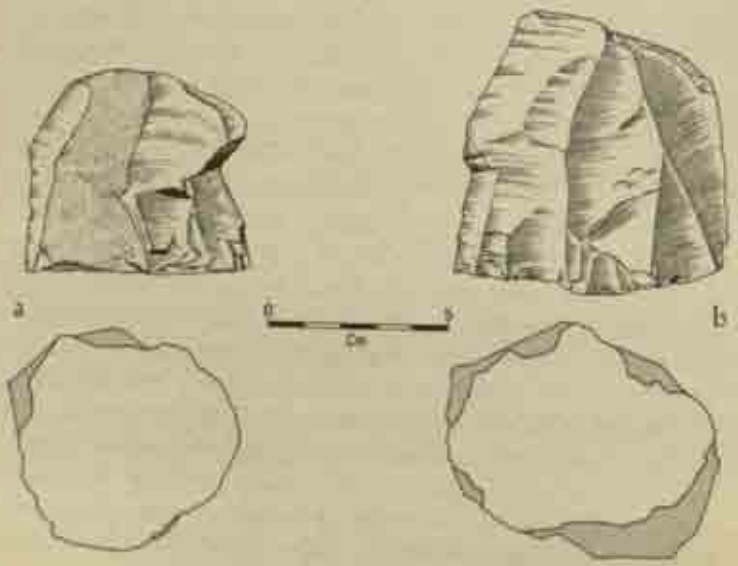
If the Tasmanians 'overlanded', they evidently migrated before rising seas created their island. Several factors are relevant to any search for their presence on the mainland. The evidence should be older than about 10,000 years, and assemblages must exclude specialised implement types made by grinding, pressure-flaking or blade-producing techniques; associated fauna should exclude dingo remains. More positively, relevant assemblages should include generalised tool types made on flakes, cores and pebbles; possibly bone tools would be associated. Except for evidence of bone-working (and local conditions did not preserve bone) these requirements are met on several excavated mainland sites. In the present state of knowledge of continental prehistory, while it is undesirable to claim positive proof of Tasmanian connections, an appreciation of Tasmanian evidence is relevant when reconstructing the early colonising phase of Australian prehistory.

Whatever the term used to describe Australia before the period of rapid technological diffusion—flake-tool, colonising, pre-hafting—it possessed a cultural reality which has been demonstrated by excavations in every state. While there was both homogeneity and longevity in technological traditions, this general pattern embraced a degree of regional variation. Despite widespread morphological similarities with Tasmanian artifacts, it is unwise to latch onto them out of context, for they outlasted the separation of Tasmania and future analysis could demonstrate that divergences were more marked than superficial comparison suggests. In this discussion, however, material is included from the Pleistocene down to the period of rapid technological diffusion, because it is interpreted as reflecting a phase (or possibly a stage) of Australian prehistory during which the continent was effectively occupied by flake-tool using people at a comparable level of technological expertise.

At Kenniff cave, for 10,000 years before the advent of specialised stone technology, some 5000 years ago, the excavated assemblage revealed a remarkable homogeneity; unfortunately no bone was preserved in the deposit. Most retouched pieces in this quartzite-flake industry were classifiable under the generic term, scraper. Despite the passage of so much time, detailed analysis revealed only slight changes in form, or variations in the size of scrapers. Their antiquity and the absence of specialised tools (? hafted), lent weight to certain morphological features reminiscent of Tasmanian stone types. These included rounded, concave and side-trimmed flakes, many of them abruptly retouched, and cores which had been utilised subsequently as scraping or chopping tools, including a horse-hoof type.

Fig. 31b

*Fig. 31 'Horsehoof' cores: a, The Tombs, layer 3B (NPL-31, 165*n*±90 BC); b, Kenniff Cave, layer 10, 1962 (NPL-10, 660±210 BC)*



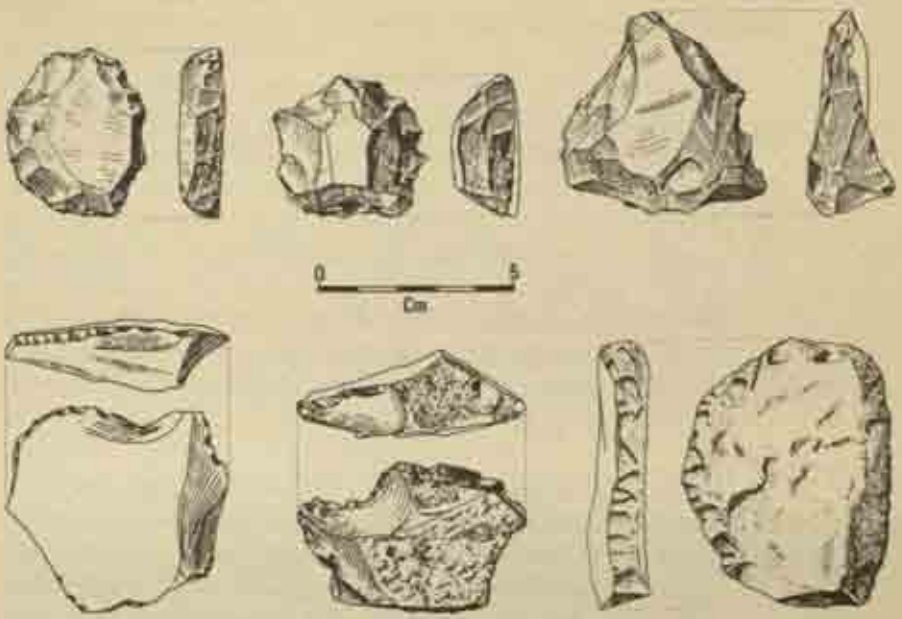
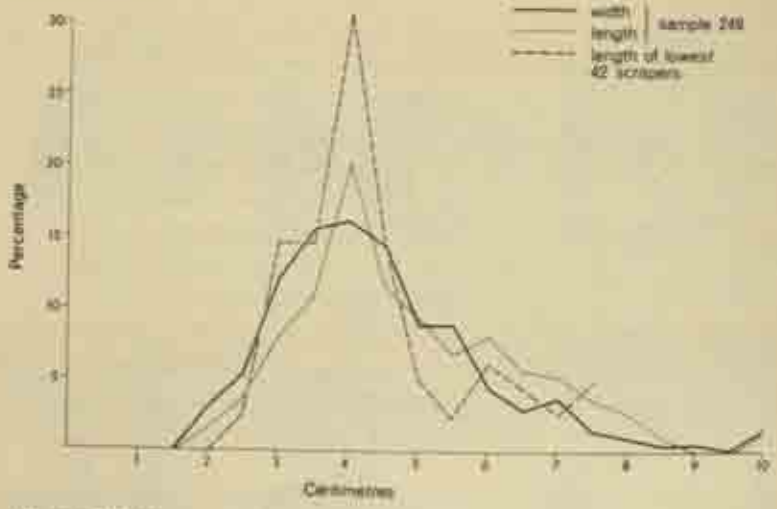


Fig. 32 Flake tools ('scrapers') from Green Gully excavation, Keilor

Closer to Bass Strait, excavations at Green Gully site, Keilor, produced a flake industry with large side-scrapers and rounded and concave varieties, whose morphology suggests affinities with Kenniff and the Tasmanian finds. Carbon dates fix the time span of this industry as subsequent to 17,000 and continuing beyond 6000 years ago. At this site, fabricators also were present, possibly their earliest known Australian occurrence. They could not have served as blade fabricators in this context, because backed-blade industrial traditions occurred only in a later terrace deposit. Although no bone tools were found, an hypothesis meriting consideration is that their function related to bone-working. In this connection, it is interesting that implements with crushed edges, tentatively identified as fabricators occur on

Figs. 32, 33

KENNIFF CAVE



GREEN GULLY

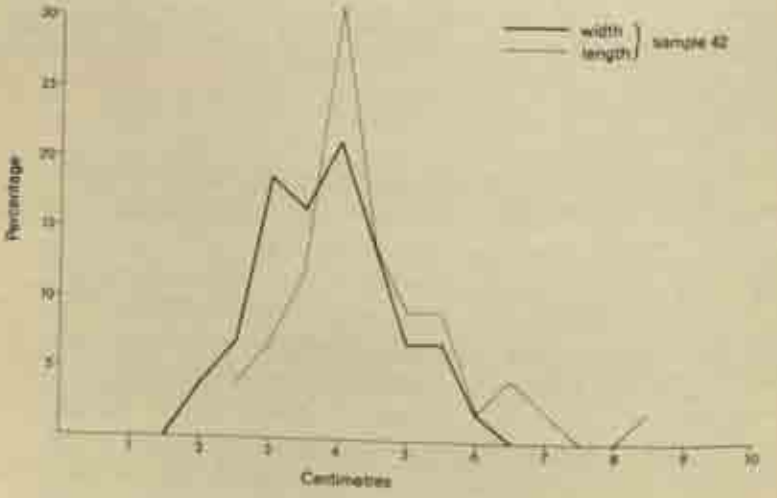


Fig. 33 Percentage distribution of 'scraper' dimensions from Kenniff Cave and Green Gully. As the Kenniff total sample included the later occupation period, when tools were extremely large, the earliest forty-two specimens were abstracted.

the north-eastern coast of Tasmania, an area where blade production was never practised.

Near Oenpelli, at the northern extremity of the continent, excavations also have recovered flake and core tool assemblages of Pleistocene age. In contexts ranging from beyond 20,000 to 7000 years ago, at Malangangerr and Nawamoyn, and around the same terminal date at Tyimede II, assemblages comprised flake scrapers and step-flaked, core-scrapers ('horsehoof cores'), in addition to edge-ground axes, whose early presence is unrecorded elsewhere in Australia. Why knowledge of grinding (and of hafting?) was confined to this area for millennia is one of the unexplained mysteries of prehistoric Australia. Even on these sites, other specialised types like unifacial and bifacial points first appear later than 5000 B.C.

The scraper-using inhabitants of Kenniff, Keilor and Oenpelli theoretically possessed sufficient time to walk to Tasmania, but even long after its isolation, the flake and utilised core tradition survived on the mainland, subject only to regional variations which perhaps affected the form rather than the substance of life, and which perhaps paralleled adaptations within Tasmania.

KARTAN ASSEMBLAGES

One such possible aspect was discerned by N. B. Tindale, years before carbon chronology. His Kartan culture is focussed on Kangaroo Island and southern South Australia; H. M. Cooper has added many sites to its distribution in this region. When first visited by Europeans, Kangaroo Island was inhabited by neither man nor dog. Yet stone implement assemblages indicated former occupation by people using flake, core and pebble tools, but lacking all more specialised implement types. On various grounds, most of which require further substantiation, Tindale inferred that the industry was earlier than those of the Murray Valley sites, and argued that its age was Pleistocene. Unfortunately, no Kartan site has as yet been excavated or carbon-dated, but this attractive hypothesis accords with the later discoveries.

The Kartan assemblages include large, step-flaked horsehoof cores with a flat base of sub-oval outline which, to judge from edge fracture, were used as scrapers or choppers. The most characteristic implements are unifacially flaked pebbles, some of them massive; others are partially flaked on one side. Other components remaining to be defined systematically, are generalised flake scrapers, including high-domed discoidal varieties, some of which have been illustrated by H. M. Cooper. This isolation of a flake and core industry deficient in more specialised elements, together with presumptive evidence for its antiquity, merits priority archaeological investigation.

Fig. 34a

Fig. 34b

Indeed, coastal south-eastern South Australia and adjacent Victorian areas offer intriguing prospects for future research, combining geomorphological and archaeological potential. Tindale and other workers have assembled evidence for human occupation on coastal sites from at least 9000 years ago; excavations on Mt Burr indicate habitation at about the same period. Tindale attributed the artifacts to his Tartangan culture, a term which I disputed. But whatever their nomenclature, the industries concerned were essentially flake-utilising, and scrapers were the dominant type; and at Mt Burr, the meagre flake industry underlay a microlithic one. Scrapers, often deeply patinated, are common on eroding surfaces along this coast, and there are strong indications that they belong to ancient dune or soil sequences, but only detailed geomorphological field research can confirm this. Over many years, collectors have remarked upon the close parallels between this large flake industry and Tasmanian surface collections; their case is strengthened by the antiquity of the few dated flake tools.

In Eastern Australia there is substantial evidence of early flake-scraper and unifacial pebble tool production. Such assemblages underlying backed blade or other specialised industries, are dated at Seelands from about 4500 B.C. (although the sample is a small one), at Capertee and Curracurrang by 5500 B.C. and possibly

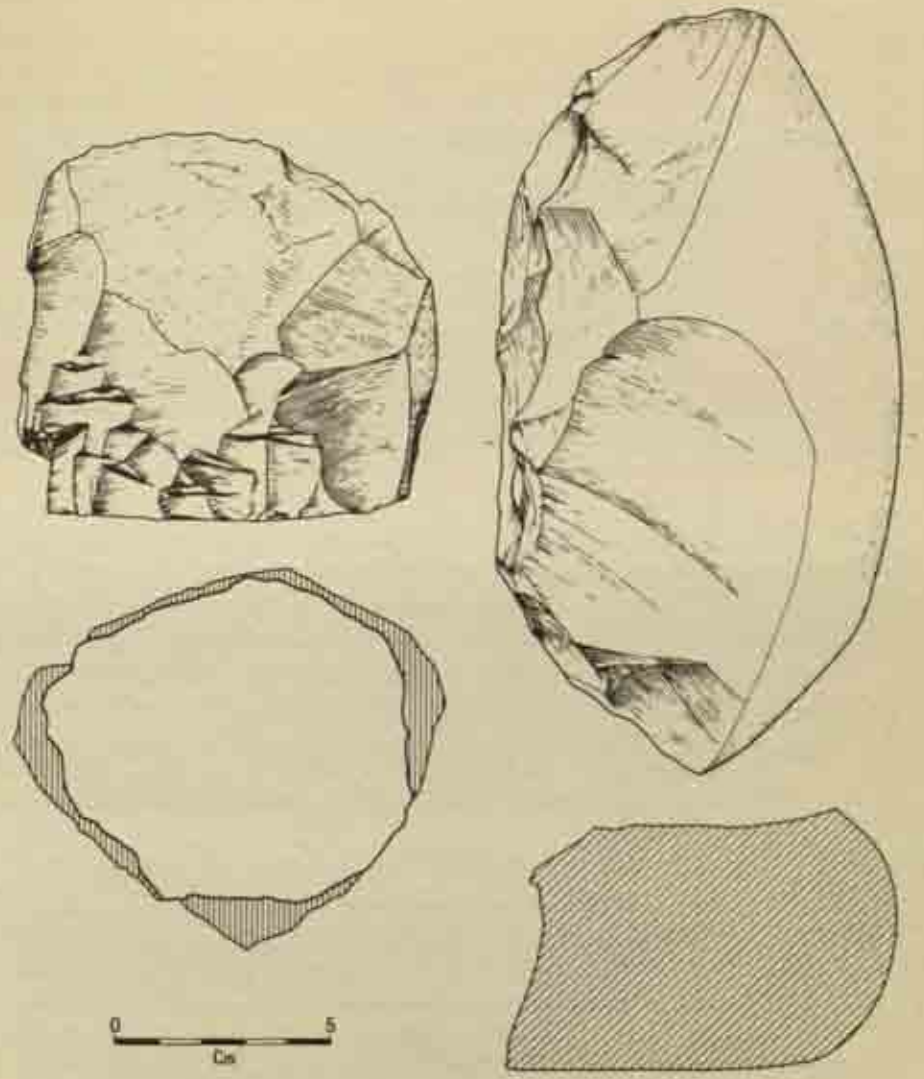


Fig. 54 Components of the Kartan culture: a, horsehoof core, Port Augusta, South Australia; b, unifacially flaked pebble, Discovery Lagoon, Kangaroo Island

at Noola by 9500 B.C. (although relevant details are unpublished); at Laura on Cape York, their presence is attested by 5000 B.C. An associated flake implement type, which occurs at Capertee, Curracurrang and Burrill Lake, is characterised by distinctive, finely serrated or notched, saw-like margins. McCarthy observed that the assemblage of flake, pebble and core tools excavated at Capertee possessed many affinities with distant mainland and Tasmanian implements (dentated flakes excepting), and termed it the Capertian culture. It is preferable to consider it as the Capertian Aspect, because of its unique regional features. For the same reasons, the argument is more cogent for rejecting Tindale's claim that nomenclatural priority demands its reclassification as Tartangan, (itself an ill-defined regional aspect).

In her analysis of the Seelands pebble tools, Dr McBryde observed that although they possessed little regularity in form, numbers had been abruptly truncated in a plane at right angles to the long axis. Morphologically similar pebble tools are known as 'hâche courte' in South-East Asian Hoabhinian cultural contexts. Because these and other pebble varieties continued into late contexts at Seelands, and because there is record of the ethnographic use of comparable pebble choppers, she reserved judgment on their cultural significance. It is a reminder, however, that older traditions persisted into later times, in association with the innovations.

J. M. Matthews attempted a metrical comparison between pebble specimens excavated at Seelands and Yamba, and collections from Kangaroo Island, and demonstrated that these groups were unrelated. However, as unifacial pebble tools are widely distributed on coastal surface sites from Queensland to South Australia and Tasmania, more research is needed concerning their possible industrial and chronological ramifications. *Fig. 35*

Tindale's claim that ethnographic pebble choppers 'differ essentially in techniques of manufacture' from Kartan specimens requires rigorous substantiation. Matthews' investigation did

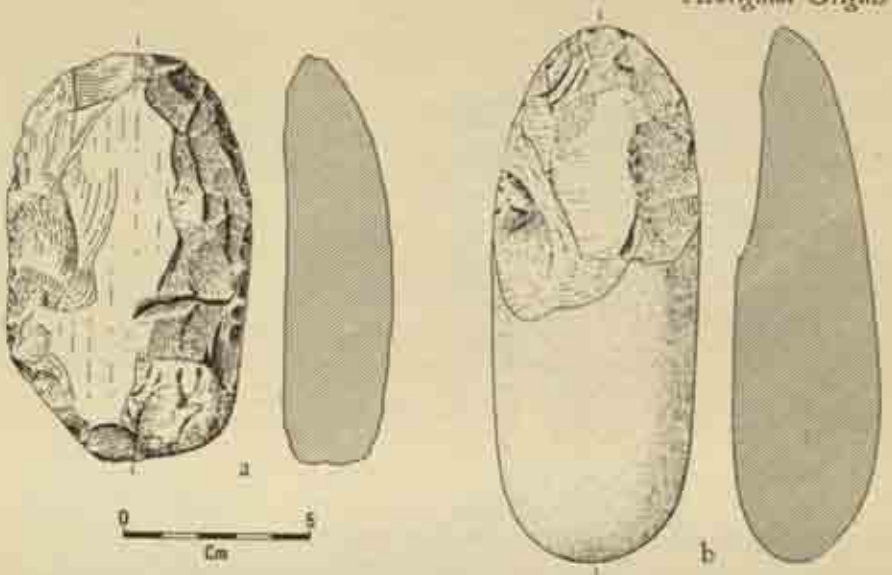


Fig. 35 Unifacially flaked pebbles, Green Gully, Keilor, Victoria. (Excavated from a terrace more recent than that containing the flake tools in Fig. 32)

reveal similarities between the New England specimens and those from the Hoabhinian site of Sai Yok, in Thailand. However, he sagely warned against assuming prematurely that this implied direct affiliation. The use within Australia of such question-begging terms as 'sumatralith' is to be deplored.

The analysis of the Ingaladdi finds, and their comparison with other Northern Territory sites, should illuminate the problem of early typology. The upper sandy layers of this shelter, dating to the last 3000 years, are a classic locality for tula adze-flake and point industries. Below this, there was a depositional break covering almost 2000 years, while the lower deposits consisted chiefly of rock rubble which accumulated between 7000 and 5000 years ago, apparently under weathering conditions differing from later times. The cultural hiatus is as obvious as the

INGALADDI

Plate 45

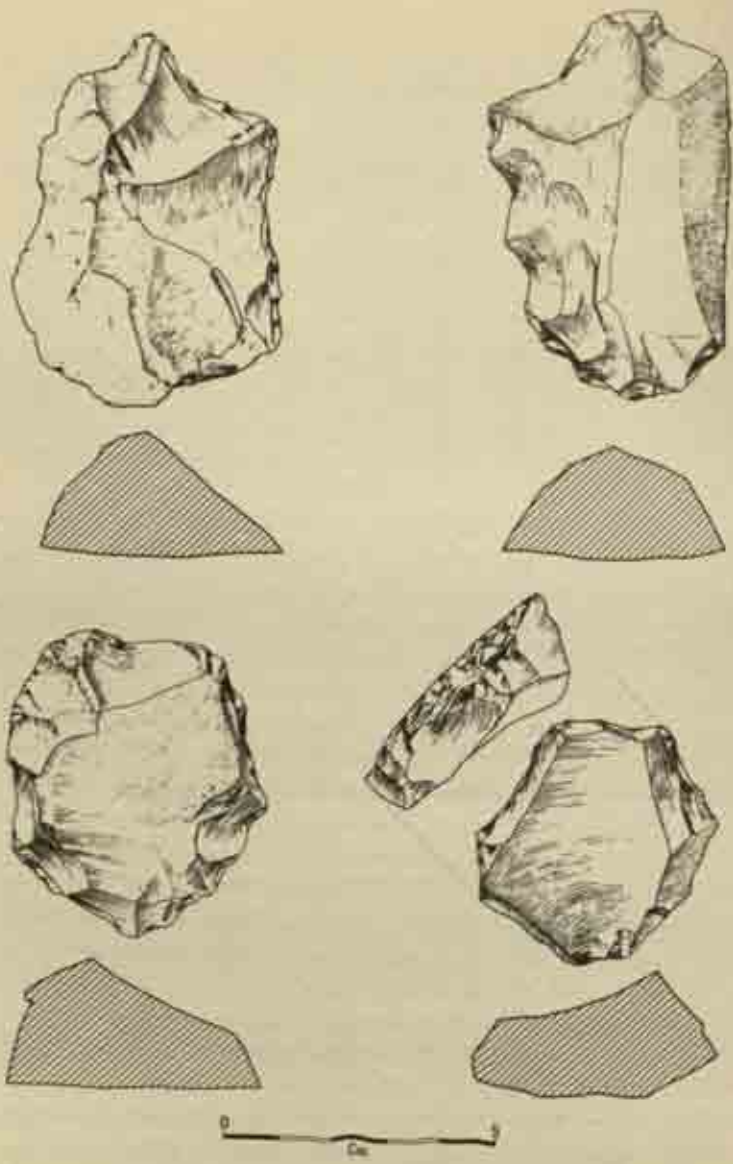


Fig. 56 Flake tools ('scrapers') from the lower layers at Ingaladdi

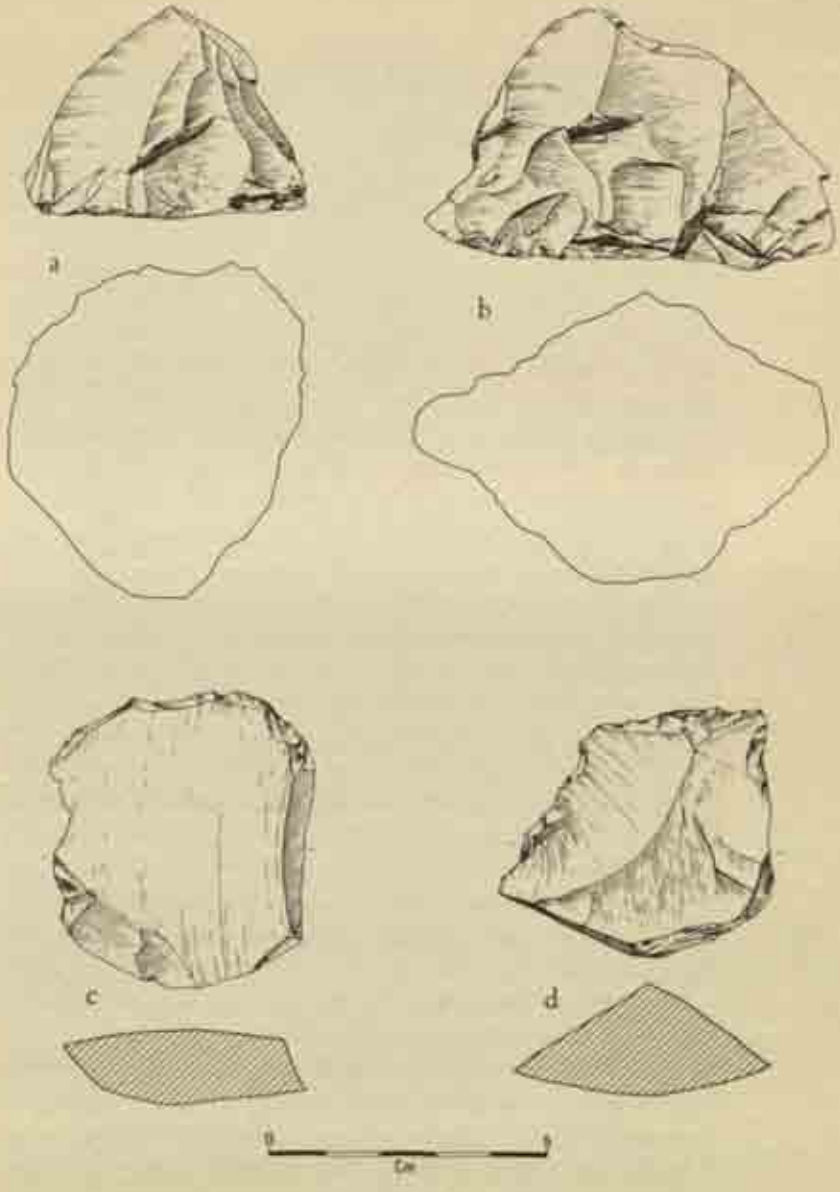


Fig. 37 Ingaladdi, layers older than 5,000 years: *a, b,* core-scrapers; *c, d,* flake 'scrapers'

depositional change. Primary stone flakes and rounded cores testify that during the earlier phase, flake-tool knappers frequented the site. Preliminary inspection indicates that almost all retouched artifacts are large scrapers, including rounded, domed, steeply trimmed, and concave types, while numerous cores were utilised as core-scrapers, reminiscent of small horsehoof cores. In undated excavations at Kintore cave, near Katherine, I obtained evidence of marked depositional changes associated with a comparable industrial sequence. Golson also obtained similar results in a shelter at Katherine, although in both these instances the early industry was poorly represented. Dr R. A. Gould informed me that in the Warburton Ranges, central Western Australia, he recently excavated a shelter in which a microlithic assemblage overlay an industry of large flake tools and numerous horsehoof cores. Detailed analyses of these assemblages are proposed.

Figs. 36, 37c, d
Fig. 37a, b
Plate 54

There is a striking similarity about the industrial pattern on all excavated sites older than about 5000 years. Despite regional variations in the total composition of stone assemblages, there is a basic continental uniformity in the generalised flake production. Scrapers from sites as removed in time and space as are Kenniff cave, Keilor, Capertee and Ingaladdi possess analogues in the Tasmanian excavations. But a differential pattern is discernible amongst other components of these industries. On the Northern Territory sites, including the Pleistocene Oenpellian group, and at Warburton, the use of heavy core-scrapers was characteristic, while on the eastern seaboard, unifacially flaked pebbles were equally prominent.

This regional distinction was not absolute, however, because horsehoof cores occur on eastern surface sites, and there were core-scrapers at Capertee, The Tombs and Kenniff cave (where one horsehoof was discarded in 10,660± 110 BC). It must be conceded also that with the possible exception of one specimen at Noola, stratigraphic proof is lacking from Laura to Keilor,

Fig. 31

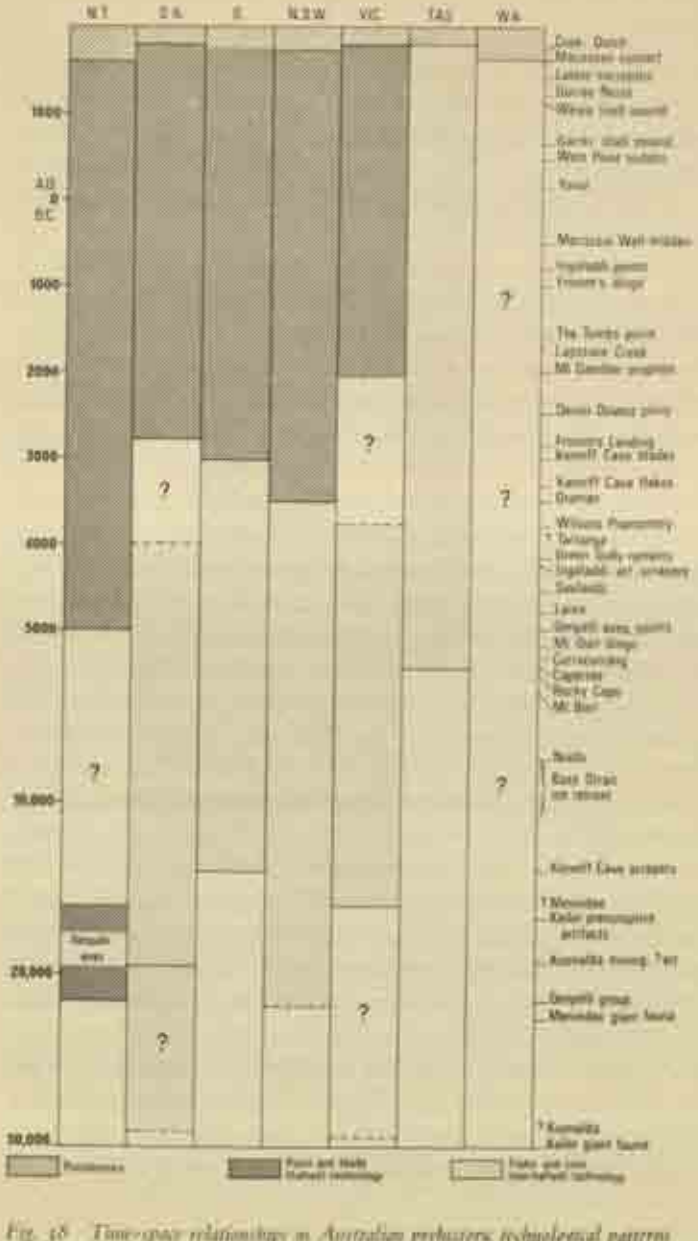


Fig. 38 Time-space relationships in Australian prehistoric technological patterns

establishing an antiquity for unifacial pebble tools greater than about 6500 years. Possibly also, because pebbles were more readily available on beaches than in arid lands, the determinants related to supply rather than to cultural demand, as Matthews argued for the morphologically distinct collections from Kangaroo Island and mainland Wakefield River.

Even with such reservations, it seems not unduly fanciful to conjecture that during Pleistocene times the flake tradition was enriched by two technological devices, one diffusing around the eastern coast and the other travelling overland. The Kartan aspect in South Australia might be explained as a mingling of the two streams, for no other mainland area combines so significantly the two elements of pebble and core-scraper tool. The prime need is the establishment of a chronology for the Kartan. Tindale pointed to the occurrence of 'Kartan-Tartangan' elements in Tasmania as proof of Tasmanian mainland origins. While I reject his use of a regionally oriented terminology, present evidence does strengthen his case for a connection. It must be remarked, however, that Jones has not recovered a uniface pebble industry in north-western Tasmania, and that although core-utilisation was practised there, his excavations did not uncover horsehoof cores.

Tindale defined his cultures by selected material traits, which proved unduly restrictive for a continent. I suggest substitution of a broad technological-economic conception. In this primary phase of Australian settlement, the technological orientation was broadly similar and the tempo of innovation was so gradual, that simple methods survived for millennia. It cannot be proved, but it may be inferred, that stone implements were hand-grasped and material equipment was simpler, (perhaps the tool-kit lacked spear-thrower, adze and boomerang), while subsistence activities were adapted accordingly. Possibly it ensured a less efficient exploitation of the full range of resources than was possible later. Settlers around Oenpelli in 20,000 B.C. (those

anomalous ground axes excepting!), at Kenniff cave in 15,000 or 5000 B C, and at Keilor and Rocky Cape in 6000 B C had more in common than mainland sites in 2000 B C had with Tasmania. The tempo of technological innovation had quickened and transformed Australian society. Perhaps, following American practice, this earlier phase should be designated a basic Stage in prehistoric development.

KOONALDA CAVE

When, and where, the first colonists stepped ashore in Australia remains to be determined; almost certainly the locality is submerged. The oldest firmly dated occupation occurs on the continent's southern shore, so that northern or north-western sites considerably older than the Oenpelli series must be anticipated. The Gallus site, in Koonalda cave, a sink-hole in the semi-arid karst limestone Nullarbor Plain, was occupied over 20,000, and possibly 30,000 years ago; (further radiocarbon estimations are planned, to clarify dating inversions). It was a quarry site, and artisans clambered down 200 feet and walked some hundreds of feet further into the darkness to obtain flint nodules from the walls. Unfortunately for later typologists, they left few clues behind. Apparently they fabricated their implements elsewhere, in more congenial surroundings, but these sites are unlocated. Only waste material and a few utilised or trimmed flakes occur in the cave, although these indicate that their technology was in the flake tradition. Dr A. Gallus, who discovered the site and realised its potential, presses the evidence further. He has erected a sophisticated, though largely intuitive, evolutionary typological sequence, which the excavated material renders difficult to sustain. The real significance of the site rests in its antiquity, the proof that Man occupied this inhospitable region so early, the existence of ancient engravings in an area of total darkness, and its rich sequence of fauna. Australian prehistorians are indebted to Dr Gallus, whose persistence reaped such a useful reward. During 1967, R. V. S. Wright excavated a trench to a depth of over twenty feet in the cave floor, and detailed sedimentary and faunal

Plate 51

investigations are in progress. There were two stratigraphic divisions, both of which are of Pleistocene age, and both contain quarry waste.

KEILOR

Keilor is another southern Early Man locality, but the date of the first occupation is disputed. There are two sites in the Maribyrnong valley, separated by two miles. At Green Gully, human skeletal remains, described below, were excavated in 1965; the related flake tools were mentioned previously. The bones are over 6000 years old, while the earliest implements fall between 9000 and 17,000 years ago.

Fig. 32
Plate 52

Plate 53

The other site has been known since 1940, when the Keilor cranium was found in the same alluvial terrace as the Green Gully burial. Edmund D. Gill investigated this problem over many years, and established presumptive evidence that the skull is aged between 8000 and 15,000 years, while human occupation perhaps extended to 18,000 years ago. Some workers (including myself, who excavated there in 1962) had reservations concerning the identification of the cultural material. Unfortunately, it was not recovered in unimpeachable stratified contexts, as at Green Gully, though possibly because operations there were on a smaller scale; what was found in these contexts is consistent with the later discoveries at Green Gully.

Subsequently, Dr Gallus, assisted by the Archaeological Society of Victoria, excavated large areas of the adjacent Keilor terrace and the upper parts of the underlying deposit, identified as the earlier Arundel terrace. They claim the recovery of numerous 'primitive' flake and core tools in both terraces, and Dr Gallus' analysis of this material is awaited. Carbon dating of the upper portion of the Arundel terrace (perhaps in its post-depositional phase) provided an age estimation of $31{,}600^{+1100}_{-1300}$ BP (ANU-65). While there is no reason to doubt Man's presence in Australia at this time, some workers are sceptical about the human origin of these finds, and are unwilling to assent until a detailed

evaluation is presented. These stream-laid deposits contain numerous pebbles and many of them are battered and rolled. It poses a nice matter of judgment (or preferably demonstration), whether the rudimentary flaking which is claimed as intentional, was simply naturally pounded, or thermally fractured. Dr Gallus postulates a complex typological sequence which correlates with Old World Palaeolithic, but with such simple flaking, it is difficult to accept its validity; yet systematic demonstration may force sceptics to recant. Meanwhile, the great significance of these excavations is that a large and varied bone collection of extinct Pleistocene fauna has been obtained, in a dated context. This result alone justifies the considerable field effort.

Another area possessing tremendous archaeological and environmental potential is the Lake Menindee area, on the Darling River, in western New South Wales. Field work over some years by N. B. Tindale and R. H. Tedford has established the occurrence of a varied extinct marsupial fauna and its probable association with human occupation, in an area of ancient sand dunes and lake shores. In Tindale's initial report, the evidence for a direct stratigraphic association of man and fauna was inferred, but not demonstrated unequivocally, and this crucial matter still requires clarification. In a note on later field work, Tindale added the significant information that one generalised flake tool and 'some rather nondescript' flakes were excavated *in situ* in a deposit which included the extinct fauna. These artifacts either date from 16,850±800 BC (GaK-335) or 24,350±1500 BC (LJ-204), because Tedford is explicit that both samples came from the same horizon. Further field research involving large-scale excavation is warranted in this area. Apart from its environmental interest, it is important to verify and determine the components of this early industry; as bone is preserved, there is the further possibility of recovering human skeletal remains.

These Pleistocene discoveries high-light one of the most significant aspects of the Aboriginal dispersion—its adaptation to

FAUNA EXTINCTION

totally new environmental conditions. One such challenge was the fauna, great or small, which differed from tropical Asian forms. This surely necessitated changes in dietary and hunting techniques, particularly on the inland plains, which perhaps were less drastic because of the dearth of carnivorous competitors. The only potentially dangerous hunter of the same game was the 'lion', *Thylacoleo carnifex*; Tasmanian Devil and 'wolf' were smaller predators.

Recently, interest overseas has centred upon Pleistocene megafauna of American prairies and African savannahs, whose extinction came suddenly and late. Natural and climatic causal explanations have proved not wholly satisfactory, and some commentators select the unique fact of Man's presence as the crucial determinant in this unprecedented 'overkill'. Merrilees calculates that a third of Australia's larger marsupial species became extinct during the late Pleistocene. If Man was also present in Australia, his possible role in this process merits consideration, for climatic explanations do beg questions. Currently there is no proof that Aborigines hunted large marsupials or birds, and such activities require archaeological demonstration. Menindee or Keilor may have been butchering-sites, but this remains to be established. Indirectly, however, frequent fires may have destroyed an ecological balance, (just as stock grazing upset it in marginal areas a century ago), triggering-off changes which left the smaller species to inherit Australia. In Recent times, these were depleted in their turn by the combined onslaught of hunter and dog, so that zoological history indicates a gradual impoverishment of species, varying from area to area, rather than any sudden mass extinction.

FOSSIL MEN

Because fossil human remains are rare and poorly documented, the racial affiliations of these early hunters are difficult to determine. From all early sites systematically excavated, skeletal remains were found at only two—Green Gully and Tartanga, while the latter, being fragmented and juvenile, possess limited

diagnostic value. Earlier commentators attributed Australian racial significance to assumed Pleistocene-aged cranial bones from Aitape, northern New Guinea. However, N. W. G. Macintosh demonstrated the inconclusive testimony of these morphologically ambiguous fragments, a conclusion affirmed by the recent dating of the site to between 4500 and 5000 years ago; Aitape appears irrelevant to the mainstream of Australian prehistory.

Over many years, Professor Macintosh has attempted objective evaluation of Australian fossil human remains, of the literature associated with their description, and of the sites where some were discovered. In 1965, he published a critical review of his detailed findings. During the same year, quarrying operations uncovered the Green Gully bones, near Keilor, which prompted intensive archaeological and geomorphological research at this site. Macintosh undertook the onerous task of analysing these bones, and his preliminary report occasioned another general synthesis of Australian evidence. The following comments draw extensively upon his work.

Apart from the Tartanga juveniles, possibly 6000 years old, there are five significant specimens—Green Gully and Mossgiel crania and associated fragmentary post-cranial bones, the Talgai and Cohuna crania, and the Keilor cranium and possibly related femoral fragments. Of these, the Green Gully bones are the best archaeologically attested, although the associated post-cranial remains pose problems. In an extraordinary prehistoric confusion, the bones of two individuals (male and female) were combined within the grave as a single delayed burial (although no bone in the assemblage was duplicated). The grave was dug into flood sediments deposited between 8000 and 9000 years ago, while collagen dating indicates the age of the bones as 6460 ± 190 B.P. Unfortunately for anatomical comparison, the cranium is female, while the other four fossil crania are male. However, morphologically, its resemblance to the Keilor skull is striking. Plate 52

The Keilor cranium, found accidentally in 1940, came from a soil pit in the same alluvial terrace only two miles from Green Gully; fragments of left femur which were found at the same time, but mislaid, are under current analysis. Extravagant claims of a last interglacial antiquity have been rejected by Edmund D. Gill, who has investigated associated problems over several years. He concluded that the skull is older than 8500 years, and probably nearer to 15,000 years, but greater precision is unlikely because his reconstruction depends upon a complex series of inferences and tests, some of them at a considerable distance from the site claimed as locus. The interest in both the Keilor and Green Gully skulls lies in their 'modern' structural pattern. Assuming the validity of their dating, this implies that people with the morphology of southern Australians already inhabited the Keilor area from late Pleistocene through post-glacial times. Birdsell, indeed, claimed Keilor man as a classic representative of his Murrayian race.

Plate 53

These two crania, together with the possible addition of the Tartanga juveniles which may possess antiquity comparable to the Green Gully female, are in marked contrast with the Talgai, Cohuna and Mossgiel fossils. The former group exhibits a full curved frontal bone, only minor post-orbital constriction, a well-filled vault, moderate superciliary prominence, orthognathism and moderate palate and tooth size. The latter group possesses a flat, receding frontal vault, low and narrow cranial vault, marked post-orbital constriction, massive superciliary arches, large palate and teeth and prognathous aspect. Naturally, caution is necessary in assessing the 'primitive' features of this group from such a meagre sample. These crania are not outside the range of modern variation. The fact of the presumed antiquity and possible co-existence of both groups, however, are provoking consideration.

The Talgai cranium came from the Darling Downs, Queensland, around 1886. It is morphologically the most primitive Australian skull recorded. Recently, Macintosh and Gill com-

menced extensive field work there in an attempt to ascertain precise details of its location and antiquity. Their exhaustive research has so far established that the skull may be aged about 12,000 years. An arduous reconstruction of the fragmented and distorted bones is contemplated. The Cohuna cranium was discovered in 1925, in a swamp by the Murray River. Its antiquity is assumed rather than demonstrated, because little systematic field work has been attempted there, although it is projected. The Mossgiel skeleton, consisting of over sixty-five per cent of the cranium and about three-quarters of the post-cranial bones, was discovered in the Riverina during 1960, and its excavation superintended by Professor Macintosh. Its minimum age is estimated at 4800 years, but further collagen carbon dating is proposed.

THE JAVANESE CONNECTION

Beyond Australia, comparative material is available, but most of it belongs to the largely unstratified and undated region of south-east Asia. Macintosh and Birdsell, oriented from the Australian area, find relevance in theories propounded by Franz Weidenreich, in which Australian racial fortunes were tied to Pleistocene Java. Macintosh concluded his 1965 survey of Australian specimens with the observation that 'the mark of ancient Java is on all of them.' It seems evident that the Tattanga-Cohuna-Mossgiel group exhibits traits which are reminiscent of Middle and Upper Pleistocene Javanese fossils—*Homo erectus (Pithecanthropus)*, and *Homo soloensis*—and these features merit detailed investigation. On the other hand, Weidenreich observed close similarities between Keilor and *Homo sapiens wadjakensis*; indeed their morphology is almost identical. Wadjak Man also inhabited Java, in what is interpreted to be a last glaciation context. (Assumptions are necessary, because the site was totally destroyed before detailed stratigraphic research was attempted.) Weidenreich's synthesis envisaged a direct line of descent in Java or south-east Asia, from *Pithecanthropus*—to Solo Man—to Wadjak Man; the Javanese origin of the Australians was implicit in this reconstruction.

In view of the two Australian cranial series which he differentiates, Macintosh recently adapted Weidenreich's thesis. Accepting that the (presumed) later Wadjak remains possess affinities with the morphologically modern Keilor–Green Gully group, he questions whether the other 'primitive' group may not derive independently in its Asian homeland from the earlier *H. erectus*—Solo Man stock. He allows for hybridisation between these groups both there and in Australia. Birdsell, arguing from other premises, has offered a similar interpretation. He suggests that living Aborigines still preserve more primitive features than characterised early, western Old World forms of *Homo sapiens*. Following his tri-hybrid thesis, he sees the Murrayians as a hybridisation within eastern or south-eastern Asia, between *H. sapiens* and *H. soloensis*—'an essentially Caucasoid type of people may have become brutalised through absorbing some genes from descendants of Sinanthropus' (*H. erectus*). In addition, Birdsell argues that independent (but undocumented) crossing within India may have produced his Carpentarian race.

It should be noted that, although their conclusions are similar, the implications of Birdsell's thesis differ from those of Weidenreich–Macintosh. The latter envisage the evolution of the Australians within south-east Asia; Birdsell also looks further afield. Macintosh may imply that two races were involved, although hybridisation at home, and abroad in Australia, obscures the picture; Birdsell envisages two distinct races (apart from the archaeologically undocumented, earlier, Negritos). While Macintosh's Keilor group may be identified with Birdsell's Murrayians, the Talgai, Cohuna and Mossgiel crania cannot be Carpentarians; they occur in areas beyond the postulated spread of that race.

NIAH

The field of south-east Asian and Australasian physical anthropology is an open and exciting one. It requires detailed and systematic evaluation of all skeletal material, allied with further archaeological field work, and an open mind. The

potentialities of all three are manifested by the excavation of the Niah cranium, in Sarawak. In this stratified deposit, a skull of *H. sapiens* was uncovered in an horizon dated about 40,000 years ago. The significance of this discovery is undoubted, as it constitutes one of the oldest known occurrences of *H. sapiens*, and serves to confirm the fact that it was chronologically and geographically possible for Wadjak Man to inhabit late Pleistocene Java. Brothwell attempted a useful description of the cranium, but unfortunately his search for comparative material was extensive rather than intensive. His citation of Australian material was only as reliable as the works consulted; and Macintosh demonstrated that earlier descriptions of Talgai, Keilor and Tasmanian crania left much to be desired. Brothwell concluded tentatively that Tasmanian and Niah skulls possessed closest affinities. Macintosh sounded a timely and repeatable warning—'Distortionary misuse of current theories is already a problem for Australian archaeologists, and it will be unfortunate . . . if some author . . . refers to a Tasmanian from Borneo as a proven fact rather than as a tenuous semblance.'

ASIAN PALAEOLITHIC INDUSTRIES

While south-east Asia looms increasingly important for physical anthropological studies, it appears equally crucial for Australian cultural origins, even in its present unstratified condition. Unfortunately, except for research at Kota Tampan, Perak, Malaysia, pioneering surveys by Hallam L. Movius and H. R. Van Heekeren were never followed by exacting regional research, and surface finds require stratigraphic substantiation.

As a generalisation, it is possible to conclude that during Middle and/or Late Pleistocene times, Island South-East Asia formed one industrial complex or cultural stage characterised by pebble or core 'chopping' tools and flake tools, of which the trimmed specimens are best described typologically as scrapers. There are evident regional (and temporal?) variations or aspects within this complex, but the similarities seem more striking. At

times of low sea level, Asia, Java, Borneo and Palawan were one land mass, but the Celebes and the Lesser Sunda Islands were never connected.

Probably the earliest aspect is the Patjitanian culture of Java (Middle or early Late Pleistocene?) which consisted of a variety, in size and form, of simply flaked pebbles or nodules, presumably fist-grasped implements, together with numerous carefully struck and trimmed flakes. Movius analysed 2419 implements, and concluded that 955 were 'choppers' or 'hand-axes' (actually, large pointed flakes), that 25 per cent were flake implements, while another 53 per cent of flakes bore use-fracture. To judge from his illustrations, the better flake tools would conventionally be classified as scrapers. Concave varieties occur, while rougher specimens are quite chunky. Movius inferred that such implement proportions testify that all tools were intrinsic components of the one industrial complex. Subsequent survey by Van Heekeren in the Baksoka Valley recovered Patjitanian tools in two river terraces, evidently separated by long geological chronology, thereby showing extreme conservation in the tempo of technological and typological change.

Scattered assemblages occur in contexts which are inferred to be later Pleistocene and may be later aspects of the same complex. In the Solo Valley, the Sangiran Flake Industry and the so-called Ngandong Bone Industry both include scrapers, core-scrapers and flake-blades of siliceous stone, and incidentally provide presumptive evidence for the antiquity of bone-working. It is postulated that they are of the same age as Solo Man, but there is no direct association proving that they actually were his tools. In the southern Celebes, on terraces at Tjabenge, similar stone flakes with high-angled striking platforms were fashioned variously as scrapers, core-scrapers and pointed flakes. Chronology is obscure, but its typological similarity with the Javanese Sangiran and presumed ancient Philippines sites is striking. Detailed descriptions and illustrations of all these assemblages are essential,

although Movius observed that they have no parallels on the Asiatic mainland.

Future publication of recently dated excavations promises insight into late Pleistocene industries of comparable technological status. On Palawan, Dr R. B. Fox excavated Tabon Cave to a depth of 160 cm., and recovered a flake industry, of which perhaps only two per cent were retouched. The remarkable feature is that these flakes persisted as the basic type from before 40,000 years to at least 9000 years ago, which was the topmost layer in the cave. The similarity with Niah is striking. Apparently, simple quartzite flakes form the main stone component at Niah from 30,000 to 10,000 years ago. Below this, slightly flaked pebble 'choppers' were present, back to at least 40,000 years.

In the Eastern Highlands of New Guinea, excavations have documented the near-Pleistocene antiquity of occupation at Kiowa and Kafiavana. Generally, the stone industry is undifferentiated, with pebble tools, core-scrapers and flake tools dominant, particularly chunky flakes, with step-flaked trimming and often concave edges; bone-working was practised. There is an exception to this core and 'scraper' complex—sophisticated, ground axe-adzes were present at Kafiavana before 8000 BC, indicating that Oenpellian craftsmen were not monopolists of this technology. Like early Australian industries, this industrial tradition evinced remarkable stability and continuity for at least 10,000 years; unlike Australia, except for a striking decrease in secondary retouch, it continued little changed into the ethnographic present.

ASIAN ORIENTATION

There are interesting lessons in Island South-East Asia for Australian prehistorians. In Malaysia and Java, a pebble/core and flake tradition possibly has early or middle Pleistocene origins: the time of *H. erectus*. There is no presumption of comparable antiquity for implements in Celebes, on the other side of Wallacea. But on Palawan and Borneo, 40,000 years ago, and in the Philippines, the Celebes and New Guinea, in presumed late

Pleistocene environments, there were flake-tool makers. Some years ago, Movius stressed the regional isolation of this tradition and the longevity of its 'monotonous and unimaginative assemblages'. Subsequent work has extended its range and dated some contexts, and in so doing, has accentuated the soundness of his conclusion. For these reasons, Movius explained Javanese prehistory as being distinct from that of mainland Eurasia because 'we are also dealing with men belonging to a different branch of the human stock'. Recent rethinking on human evolution in the same region surely underlines Movius' intuition; although, from her analysis of the Malaysian Tampanian industry, Ann de G. Sieveking prefers to seek the industrial origin of early south-east Asian stone typology in the early Pleistocene of Africa. Carleton S. Coon, on the other hand, has proposed the term Movius's Line as the demarcation between the two major archaeological regions.

Prehistorians of Australia must look towards Island South-East Asia for the origins of their people and culture. Explanations for the surprising longevity of Australian stone industries in the Core and Flake-tool Phase (or Stage) may be found in the technological aptitude of prehistoric inhabitants of that region. (New Guinea prehistory may be similarly interpreted.) It is not inconceivable that Wadjak Man would have found familiar tools at Kenniff cave 16,000 years ago or at Green Gully in 6000 B.P. The differential components of industries at Kenniff, Kangaroo Island or Ingaladdi might be explained by ideas (or prototypes) transmitted from different points of origin (Celebes?, Java?) by people at a basically similar technological level; but nothing can explain Oenpelli's and Eastern Highlands New Guinea's antique edge-ground axes (local invention in Island South-East Asia?). Is it coincidence that parallels for many Inventive Phase tools occur in later prehistoric Indonesia? Is it significant that it was only in the last few thousand years that implements (and ideas?) diffused on an almost global scale? (Geometric microliths, 'Bondi points'

in Bengal; uniface, biface and serrated points in the Toalean of Celebes, itself Japanese influenced?). With evidence for Pleistocene art on the Nullarbor Plain and grooved, ground axes in Arnhem Land, it is relevant to recall that Japan claims ownership of Pleistocene pottery. Pacific research promises new perspectives in human prehistory.

From Pleistocene Java Man to the last Macassarman who visited Australia in AD 1907, Australian prehistory remained oriented towards Island South-East Asia. Captain Cook and Sir Joseph Banks inadvertently shifted the historic balance, which abortive colonial settlements on the north coast failed to redress. Yet historic Australia's recurrent involvement in the same region since 1940, confirms that history, like prehistory, repeats itself.

CHAPTER VI

Field Archaeology

Two trees . . . measuring from sixty to sixty-five feet from the ground to the lowermost branches . . . bore notches made with flint implements, the bark having been removed for the purpose; these notches forming a kind of steps to enable persons to get up the trees and rob the birds' nests . . . were fully five feet apart . . .

ABEL JANSZOON TASMAN, *Journal*, Tasmania, (2 December 1642)

SHIP-BOUND Tasman may have initiated Australian field archaeology with this observation, but unfortunately, most Aboriginal field monuments were perishable, like these trees. Throughout Australia old or decaying gums still survive with similar rude footholds cut by possum hunters or wild-honey gatherers. Others bear long scars where bark sheets were removed for canoes or shields, possibly with the aid of rough fist-grasped choppers. Robert Edwards arranged a major programme to record many 'canoe trees' in the Lower Murray Valley, most of which are doomed because of rising river levels following water storage projects. Bush fires also wreak havoc; six canoe trees were set alight outside Devon Downs shelter in 1967 because of a vandal's match.

Plate 55

Plate 56

BARK AND WOOD DECORATION

Eucalypt bark also was employed universally for shelters and breakwinds, frequently upon lightly framed structures whose superficial stake-holes normally would defy archaeological detection. At Gymea Bay, however, Megaw uncovered some possible stake holes. Bark painting is restricted today to areas of coastal Arnhem Land, where detached sheets are decorated in traditional styles, chiefly for commercial reasons. At Oenpelli in 1912, Sir Baldwin Spencer collected over 200 bark paintings, many of them the size of a door. Earlier observers record that the custom of decorating the inner walls or ceilings of bark shelters was widespread throughout the north, the south-east and even in Tasmania. Only two examples of southern bark paintings

Plate 57

survive, while few Arnhem Land specimens were collected before Spencer's appreciation of their importance. Plate 58

Another distinctive, though vulnerable, field monument was the carved tree, mostly concentrated within the Darling Basin, New South Wales. Usually the bark was removed and engravings made on the trunk in geometric and linear patterns—circles, spirals, concentric diamonds and lozenges. Upwards of 1000 examples are known, many of them post-European and cut with steel axes, but few will survive this century *in situ*. Like Old World megalithic monuments whose art form they recall, these dendroglyphs marked ceremonial grounds and burial places. Frequently occurring singly, 120 carved trees were counted around one ceremonial (Bora) ground. Near the Lachlan River in 1817, explorer John Oxley came upon a pair of trees whose designs faced a recently constructed earthen tomb and extensive outworks which, maladours notwithstanding, he excavated. Plate 59 Plate 62

Aboriginal methods of disposing of their dead, which varied regionally and presumably with time, offer a complex field for future archaeological research. Unfortunately, few practices were designed to assist future stratigraphic reconstruction, while grave goods were either rare or perishable. Ethnographic sources indicate that burial might be extended or flexed, delayed or immediate, sunk in shallow graves or covered with stone or earthen mounds, exposed on tree branches or hidden within their equally inflammable hollow trunks. The Green Gully remains, over 6000 years old, exemplified delayed, extended burial practices. Corpses might be cremated or wrapped in skins and bark, desiccated and widely transported or stuffed in rock crevices, dismembered and portions hoarded or ritually consumed. BURIAL PRACTICES

Three archaeologists are contributing objectivity to this confusion. Betty Hiatt is preparing distribution patterns from ethnohistoric sources. Near Grafton, at Blaxland's Flat, Isabel McBryde excavated a group of nine bark-wrapped extended burials in a small rock shelter. Investigation of these remains,

which are about 1100 years old, promises important results. Both delayed burial and cremation practices may be represented, while one adult female skull possesses an oval hole, strongly suggestive of pre-mortem trepanation, a practice hitherto unrecorded in Australia. South of Brisbane, at Broadbeach, Laila Haglund-Calley is excavating the largest known Aboriginal burial ground. About 150 graves have been uncovered and the detailed analysis of burial practices, grave goods and physical anthropology should contribute basic data, never before available from a large, controlled sample.

Early accounts indicate that burial mounds and other earthworks were particularly common in eastern Australia. Both the Western District and Riverina Plains were dotted with 'murnyongs' or 'native ovens'—isolated middens up to 100 feet in diameter and several feet thick, often crammed with burials. A century of farming operations has levelled most of them. Perhaps aerial photography could assist their location. Through a train window in 1869, an observant Western Victorian passenger noted, that 'owing to the drought . . . the green mantle of grass had disappeared, leaving the black patches of oven-mounds very easily distinguishable from the bare surface'; elsewhere, he saw crops growing green and tall on fertile ashy middens.

Corporate activities which left their mark on the landscape were varied, but few have been sought or surveyed. In Western Victoria, shallow ditch systems dug in marshes served as eel traps; one was estimated to cover ten acres. On inland rivers and coastal littorals, extensive stone fish traps and weirs survive. The best known example is at Brewarrina, on the Darling River, which stretched about 450 yards along its course. Desert Aborigines constructed stone 'hides' to assist their food hunt, which still exist.

FIELD MONUMENTS

The most common surviving relics are stone arrangements or alignments. In the intimate link existing between Aborigines and their territory, topographical features, plants and animals

were an unquestioned, integral part of existence. Like themselves, they were endowed with life essence in the dream-time by creation heroes. These totemic ancestors were transformed into natural features—rocks, cavities—but retained their life essence. Around such totemic features appropriate ceremonies were performed. C. P. Mountford has demonstrated that almost every topographical feature on Ayers Rock possesses deep mythological reality. From a knowledge of the living people, therefore, a prehistorian realises that rocks did not require human 'arrangement' before they played an intimate role in ceremonial life; yet, unless human agency was involved in erecting them, he cannot identify them archaeologically. On the other hand, it is reasonable to presume that the function of many stone arrangements was comparable: their owners identified them as totemic beings who participated in creation dramas; others demarcated areas where such events occurred. The latter function possibly explains many ground monuments, consisting of lines or circles of small stones enclosing a clear area. Examples are known throughout Australia, ranging from a few square feet to acres in area, and in the east were termed Bora grounds.

There are also many examples of large, single standing stones, or cairns, which have been constructed with some labour. Dr McBryde has described several major groups in New England, while R. Jones excavated two superimposed alignments of stones on an exposed dune on Tasmania's north-east coast. Possibly the most striking 'megalithic' structures are stark, up-ended sandstone slabs situated in the Great Victoria Desert. One alignment of twenty upright arrangements about three feet tall continues regularly for more than thirty yards; the entire complex covers hundreds of square yards and the dominant impression is of systematic planning.

Plate 60

The evidence of carved trees, however, indicates that ceremonial 'arrangements' did not consist of stone alone. Indeed, examples of crocodile, kangaroo and emu bone arrangements

Plate 61

are known, presumably at totemic increase sites. In New South Wales, earth and sand figures up to thirty feet long were formed, representing mythological sky culture-heroes. Comparable designs were engraved in the earth or upon the living rock, and in the sandstone north of Sydney this latter art form has survived at over 1000 sites.

Possibly more pragmatic in origin was the Tuntable Falls stone pathway, investigated by Dr McBryde in dense, rugged, New England rain forest. This well-built track, almost four feet wide, stretches sixty yards through forest, and possibly provided access across a steep ridge. This is material testimony to the veracity of early accounts from Tasmania and Queensland, claiming that Aborigines kept trackways clear through otherwise impenetrable forest. Near Sleisbeck, western Arnhem Land, is a ceremonial pathway, about four feet wide, which is defined by stones for almost three quarters of a mile, as it winds up a hill and down a valley, to a painted rock shelter in which are piled numerous animal bones.

In north-eastern Arnhem Land, C. C. Macknight recently surveyed unique stone arrangements, which are more appropriately described as 'pictures'. These consist of small stones, forming simple outlines of objects most of which became familiar to Aborigines only through their contacts with Macassan trepangers or their voyaging to Macassar on praus. They include praus, houses, and functionless, trepang boiling hearths.

Plate 13

QUARRY SITES

Plates 64, 65

Quarries are a type of field antiquity meriting systematic field and petrological investigation. Although McCarthy surveyed the literary sources for the occurrence and circulation of their products, with few exceptions they have been ignored by field-workers, and research interest is only developing. Jones in Tasmania, and McBryde in New England are currently engaged on such studies. Two quarries, which reveal impressive attainments of human perseverence and initiative, deserve more fame than the better-known Mt William diabase source in Victoria.

One is Koonalda cave, deep under the Nullarbor Plain, where nodules of flint protrude from the Eocene limestone walls. Evidence obtained by Dr A. Gallus and R. V. S. Wright established that this flint served as a stone source well over 20,000 and possibly 30,000 years ago; this though the cave was dark and hard to reach.

Western Australia boasts the immense ochre mine at Wilgie Mia. A hillside is virtually an open cut, varying between fifty and a hundred feet in width and sixty-five feet in depth, while ochre seams have been tunnelled further into the hill. The excavation represents the removal of several thousand tons of rock, and there is ethnographic evidence that wooden scaffolds were propped against the rock to assist quarrying operations. Heavy stones were used as mauls for battering the rock, while wooden wedges up to eighteen inches in length were driven in to prise out the thick red or yellow ochre seams. The cavity floor is stratified in places to a depth of almost six metres, and fortunately local conditions have preserved the wedges throughout the deposit. The site is under archaeological investigation by I. M. Crawford.

ROCK ART

Aboriginal rock art is best comprehended in its natural setting, and alone. It was dusk on a wintry evening in 1960 when I reached The Tombs. The frieze of predominantly red stencilled hands seemed almost luminescent, while the curved rock amphitheatre was dominated by a single figure—the stencil of a man with arms outstretched, standing before the entrance to a low, deep cave. It was a memorable occasion, and to me, the brooding stillness and chill air are an essential element in recalling the aesthetic or intellectual impact of the site, although this cannot be conveyed pictorially; so also, is my later realisation, that fingers of handprints within the recess behind the figure were 'mutilated'. An uncongenial spot to linger in, presumably it was even more so for an Aboriginal; this was no gallery dedicated to the proposition of 'art for art's sake'.

Plate 63

Explorer George Grey experienced the same stimulus in the Kimberleys in 1838, when he stumbled upon the first known

gallery of Wandjina art—'I was certainly rather surprised at the moment that I first saw this gigantic head and upper part of a body bending over and staring grimly down at me.' It was my fortune, near Ingaladdi water-hole, 500 miles east of Grey's area, to face two giant figures which are as impressive in their setting and artistic merit, as in their evident cultural affiliations with the Wandjina style.

Plates 66, 67

Plate 68

This personal testimony serves to illumine aspects of Aboriginal art. The site itself must be comprehended as frequently more meaningful than the art which covered it. For the appropriate social group, it was the locality which possessed life essence or totemic and mythological reality. The drawings on significant sites were simply the medium through which ancestral creation beings continued to influence every-day life. Because of the personal relationship between man and so many of the topographic features of his tribal domain, it is probable that although both secular and sacred (mythological) themes are illustrated, 'sacred' subjects dominated; to the 'owners', even mundane items realistically depicted often possessed symbolic or mythological meaning. Generally, this purpose was indirect, as tangible evidence of the dream-time and of abiding totemic beings. Some related more directly to the increase of the natural species, as in the case of Wandjina and associated animal drawings, when ceremonial retouching produced rain or perpetuation of the particular species. In parts of the Northern Territory, it was essential to scratch certain rocks to ensure rain. The pronounced sexual theme in many regions is another example of wishful thinking associated with totemic sites, although it would seem unrealistic to interpret most art as being sexually oriented. Sorcery was another factor, and many grotesque western Arnhem Land paintings of recent age were so directed. Yet there are recorded examples of Aborigines apparently decorating rocks for purposes of entertainment alone, and some of the Disney-like characters at Ingaladdi would seem appropriately classified in

Plate 77

this manner, while those depicting European scenes may have recorded memorable events in every-day life which, given time, might have become incorporated in the dream-time marvels. Plates 70, 71
As to decoration on weapons, it is evident that ornamentation often played a vital 'functional' role; yet some older ethnographic specimens are so superbly proportioned and incised, that to deny their additional aesthetic motivation ignores the dignity of human creativity.

Although artistic influences extend over immense distances (Wandjina derivatives also occur in the Musgrave and Peterman Ranges, 1000 miles south-east of Grey's sites), and styles overlap and co-exist (in addition to Kimberley motifs at Ingaladdi, there are Western Arnhem Land 'X-ray' figures, Central Australian circle and line designs, and realistic depiction of European culture-traits), there are broad stylistic distribution patterns which must represent artistic provinces. For example, Wandjina and X-ray styles are distinct from the stencil form of southern Queensland or from the recently discovered major galleries of Cape York, and this generalisation is not refuted by the presence of some stencilled designs in all areas. There are also regional variations in methods of engraving or abrading rock surfaces. Plates 68, 69, 72, 76 Plates 74, 75 Plates 76–80

However, because so few areas have been surveyed in detail, it is preferable to await further regional research before defining culture-provinces. It is salutory that, whereas in 1961, a prestigious overseas publication designated New England an artistic blank, Isabel McBryde and W. J. E. Webster subsequently recorded a wealth of engraved and painted sites. The Australian Institute of Aboriginal Studies is supporting many projects designed to record data objectively, by camera, scaled drawing or coding and tabulation of individual components. Robert Edwards in the Northern Territory, P. Trezise in Cape York, I. M. Crawford and B. J. Wright in Western Australia, D. J. Tugby in Victoria and C. P. Mountford in Central Australia, are amongst workers whose memoirs will contribute basically to art appreciation.

Mrs Lesley Maynard has adapted the techniques of A. Leroi-Gourhan to Australian sites by observing the location of each motif and its relation to the total composition of subjects on the rock surface.

PREHISTORY AND ART

It is difficult for a prehistorian to assess Aboriginal art. Until recently, it possessed no time depth, because, except for a fallen engraved slab uncovered in an upper layer at Devon Downs, antiquity could be inferred but not demonstrated. Systematic unravelling of stylistic superposition, developed by F. D. McCarthy, provided a relative sequence for some areas; yet the absolute age of all styles involved is undetermined, and it is rash to correlate over great distances. Neither can an Australian prehistorian escape the conditioning influence of ethnographic data. A prehistorian may infer methods of application or techniques of engraving, from observation, but comment concerning motivation and meaning is beyond the scope of normal archaeological activities.

With the riches of contemporary data, it is difficult not to offer anachronistic or fallacious comment. For example, it is established that whereas dream-time creative forces in Arnhem Land emphasised female fertility—mother concepts—clan heroes in the Kimberleys were male, and were more directly associated with natural forces—rain, lightning, animal species. Should ancient art in these regions be validly interpreted in this fashion? How would an archaeologist interpret the concentric circles and sinuous lines on an excavated Central Australian stone 'tjurunga'? (Unfortunately, the example is hypothetical, as no excavations have been attempted there.) To an initiated Aboriginal, some tjurunga are, in a sense, formalised maps of the region, clearly indicating wells, tracks and other topographic features; in another sense, they are a symbolical portrayal of his tribal territory; they also possess deep ceremonial significance, for they testify to the complex wanderings and activities of totemic ancestors. (Perhaps their appeal to a prehistorian lies primarily

in their hallmarks of a 'Bronze Age' art style, but tribal elders are ignorant of this.)

A further complicating factor known to Australian prehistorians is the fact that permanence was not the purpose of most Aboriginal art. Only remnants survive, thereby distorting the evidence. (If the totality of ceremonial art survived, to what extent would the 'sexual' content of Aboriginal art be diminished?) For example, an archaeologist would be fortunate to recover painted bark, decorated skin cloaks and weapons, or richly elaborated Melville Island burial poles. He would be even less likely to find ceremonial regalia, such as elaborate Waninga totemic designs, which were deliberately destroyed at the end of a brief ceremony, after hours spent in their construction. He could never tell whether rock art rituals were associated with intricate body decoration or with the production of ground decorations combining similar artistic motifs. Yet ethnography demonstrates that in many areas, artists working as a group created huge ground compositions, remarkable for their sense of composition, colour, feeling of balance and sureness of execution. Tindale witnessed a drawing in sand—an exposition of a myth—whose production occupied two hours and stretched over twenty-five feet—the audience kept pace with the pictographic record by shuffling along without rising to their feet. Plate 71

Superposition studies indicate changes of style and motif. Should a prehistorian therefore consider interpretations of art provided by tribal elders (repositories of traditional lore) as meaningful? Perhaps some anthropologists have been overeager to trust informants who were not versed in older styles. Should the testimony of G. A. Robinson be accepted on Tasmanian art, of which he was the sole interpreter? His explanation was that painted circles represented men and women, while engraved examples were black men and white men. Robinson questioned in good faith, but his simple explanation is unconvincing. Plate 79

If prehistorians are loathe to generalise about the prehistory of Aboriginal art, it is understandable that attempted correlations with European Palaeolithic art disturb them. 'Palaeolithic' and 'primitive' are common terms in popular books, but R. M. Berndt's protest that Aboriginal art 'is contemporary, or almost so, and no more prehistoric than the people who are responsible for it', was a timely warning.

PLEISTOCENE ARTISTS

Recently, however, valid archaeological evidence has been recovered which testifies to the remarkable antiquity of Aboriginal art. At Kenniff cave, numerous ochre fragments were present at all levels, indicating that colouring materials were carried there during the course of over 15,000 years. The evidence was more positive at Ingaladdi, where excavated broken sandstone pieces

Plate 45

were incised with simple linear and 'bird-track' motifs. This engraved art was buried between some 5000 years and 7000 years ago, but it is interesting that linear motifs were characteristic of the region during this century. (Their purpose apparently was rain-making: providing an object-lesson in the need for restraint in explaining prehistoric phenomena.)

One of the most significant finds in Australian prehistory resulted from Dr A. Gallus' work at Koonalda cave. In total darkness, some 500 to 1000 feet within the underground cavern, and in part reached only by crawling through a narrow passage, are a few thousand square feet of wall markings. These consist of meandering grooves made by fingers on the soft limestone walls,

Plate 80

and V-sectioned linear grooves. Associated on these decorated surfaces, but only there, are thin parallel scratches, suggestive of animal claws. Similar markings are present in darkness in two

Plate 81

caves near Katherine, Northern Territory, including Kintore. Curiously, no animal or reptile is thought capable of marking the walls or ceiling in some most inaccessible places, and there are indications that the scratches are of some antiquity. There is a possibility, therefore, that the markings were made through human agency.

The Koonalda evidence demonstrates that, contrary to popular belief, Aborigines worked in dark and confined areas; there are stencilled handprints in the darkness of another Nullarbor cave. The Koonalda markings are partly buried by rock rubble, which major fall apparently occurred early in the history of human occupation. In these circumstances, the minimum age for the art may be more than twenty millennia, and it is possibly older than any dated Old World art.

Australian field-workers face an arduous but exciting future to record and conserve field monuments of considerable variety. Given the immense time depth of prehistory, the documentation of technological and cultural developments and associated environmental changes offer a stimulating challenge. Aboriginal society, despite its latter-day critics, was never static. There was scope for the innovator as well as for the dreamer, and the Aborigines were not captives of an unchanging and hostile environment. That is the essence of Aboriginal prehistory, which endows it with the creativity of the human spirit.

Chronological Table

BASED UPON SELECTED RADIOCARBON DATES

Locality	Lab. No.	Age BP	Age BC	Comment
Lake Callabonna S.A.	NZ-205	>40,000		extinct giant fauna, no human associations
Mammoth Cave W.A.	O-657	>40,000		as above
	TX-31	>31,000		
Mowbray Swamp Tas.	Y-148	>37,760		as above
Keilor, Vic.	ANU-65	31,600 $\pm^{1100}_{1200}$	29,650	extinct giant fauna; Man claimed as present
Koonalda, S.A.	V-82	31,000 ± 1650	29,050	unexplained inversion with ANU-71 and
	V-92	19,900 ± 2000	17,950	-148 Gallus excava-
	ANU-180	21,200 ± 700	19,250	tion; Man present; giant fauna absent
	ANU-148	19,400 ± 450	17,450	Wright excavation;
	ANU-71	19,300 ± 350	17,350	Man present; giant fauna absent
Lake Menindee, N.S.W.	LJ-204	26,300 ± 1500	24,350	samples from same
	GaK-335	18,800 ± 800	16,850	stratum, giant fauna present; Man probably present
Malangangerr, N.T.	ANU-77b	22,900 ± 1000	20,950	edge-ground axes,
	GaK-628	19,600 ± 550	17,650	some possibly
	GaK-629	22,700 ± 700	20,750	grooved; flake and
	ANU-19	18,000 ± 400	16,050	core tools
Nawamoyn, N.T.	ANU-51	21,450 ± 380	19,500	edge-ground axes, flake and core tools
Keilor, Vic.	NZ-207	18,000 ± 500	16,500	presumed human
	NZ-367	15,000 ± 1500	13,500	occupation; giant fauna absent

Locality	Lab. No.	Age B P	Age B C	Comment
Green Gully, Vic.	V-73	17,300± 700	15,350	possible human occupation; giant fauna absent
Kenniff Cave, Q.	NPL-68	16,130± 140	14,180	numerous flake tools. An inversion between NPL-68 and GaK-526
	GaK-526	13,200± 300	11,250	
	NPL-33	12,900± 170	10,950	
Lake Colongulac, Vic.	Y-170	13,700± 250	11,750	extinct giant marsupials; date on freshwater shell
Ortorroo, S.A.	NZ-381	11,100± 130	9,150	*Diprotodon* dentine. NZ-206, 6700± 250, also dentine, is rejected by some, which renders this dubious also
Noola, N.S.W.	V-35	12,550± 185	10,600	121 in below surface; 74 in below surface; note the inversion; Man present
	GaK-334	11,600± 400	9,650	
The Tombs, Q.	NPL-64	9,410± 100	7,460	first occupation by flake users
Green Gully, Vic.	V-64	8,990± 150	7,040	flake industry—scrapers
Cape Martin, S.A.	NZ-69	8,800± 120	6,850	flake tools in ancient soils
Mt. Burr, S.A.	GaK-429	8,600± 300	6,650	flake industry; dingo bones between these levels
	GaK-427	7,450± 270	5,500	
Rocky Cape, South Tas.	GXO-266	8,120± 165	6,170	earliest dated human occupation in Tasmania; both samples from base of deposit
	V-86	7,465± 150	5,515	

Locality	Lab. No.	Age BP	Age BC	Comment
Curracurrang, N.S.W.	GaK-482	7,450± 180	5,500	earliest occupation; flake and pebble tradition
Capertee, N.S.W.	V-18	7,360± 125	5,410	as above
Seelands, N.S.W.	V-27	6,445± 75	4,495	as above
Laura, Q.	I-1715	6,870± 150	4,920	flake tools; unifacial pebble tools later
Green Gully, Vic.	NZ-676	6,460± 190	4,510	Green Gully burial (collagen)
Nawamoyn, N.T.	ANU-53	7,110± 130	5,160	edge-ground axes; 2 stone points
Malangangeri, N.T.	GaK-627	5,980± 140	4,030	axes and flake tools—no points
Ingaladdi, N.T.	ANU-60	6,800± 270	4,850	brackets duration of
	GX-104	6,255± 135	4,305	core and flake tool
	ANU-58	4,920± 100	2,970	occupation; linear engravings
Tyimede 2, N.T.	ANU-18	6,650± 500	4,700	points presumed present
	ANU-50	4,770± 150	2,820	points present
Tartanga, S.A.	L-271E	6,020± 150	4,070	flakes and adze-flakes; estimation made on mussel shells in limestone area
Kenniff Cave, Q.	NPL-66	5,020± 90	3,070	latest purely flake assemblage
	GaK-523	4,130± 90	2,180	post-dates delicate point production
	NPL-65	3,830± 90	1,880	earliest backed blades
	NPL-32	2,550± 90	600	latest backed blades just above this layer
Graman, N.S.W.	GaK-806	5,450± 100	3,500	earliest backed blades

Locality	Lab. No.	Age BP	Age BC	Comment
Seelands, N.S.W.	V-24	4,040± 65	2,090	as above
Sister's Creek, Tas.	NSW-17	6,050± 88	4,100	earliest occupation
Rocky Cape North, Tas.	V-89	5,425± 135	3,475	earliest occupation
Fromm's Landing 2, S.A.	NZ-364	4,800± 100	2,850	earliest occupation;
	P-308	3,750± 85	1,800	dates bracket pirris and geometric microliths; tula adze-flakes
Devon Downs, S.A.	L-217G	4,250± 180	2,300	pirrian climax
Wilson's Promontory, Vic.	GaK-968	3,920± 90	1,870	backed blades: first
	GaK-970	3,480± 90	1,530	appearance may pre-date this
Capertee, N.S.W.	V-34	3,623± 69	1,673	flake industry, predates backed blades
Lapstone Creek, N.S.W.	ANU-10	3,650± 100	1,700	backed blades: the 'Bondaian' type site
	ANU-11	2,300± 100	350	Bondi-points disappeared, clouera present
The Tombs, Q.	NPL-31	3,600± 91	1,650	pirris and backed blades
Fromm's Landing 6, S.A.	NPL-29	3,170± 94	1,220	brackets dingo
	NPL-28	2,950± 91	1,000	skeleton and highest Murray R. flood; latest backed blades
Wombah, N.S.W.	GaK-508	3,230± 100	1,280	shell midden; unifacial pebbles, Bondi-points
Ingaladdi, N.T.	ANU-57	2,890± 71	940	probably earliest points and tula adze-flakes
Capertee, N.S.W.	V-33	2,865± 57	915	backed blades

Locality	Lab. No.	Age BP	Age BC	Comment
Curracurrang, N.S.W.	GaK-688	2,360± 90	410	earliest backed blades
Macassar Well, N.T.	V-60	2,445± 80	495	earliest occupation of shell mound
West Point, Tas.	V-69	1,850± 80	AD 100	as above
Yarat, N.T.	ANU-16	1,620± 100	AD 330	early phase of occupation, point industry
Garrki, Milingimbi, N.T.	V-61	1,305± 80	AD 645	early stage of accumulation of 20 feet high shell mound
Weipa, Q.	I-1738	810± 105	AD 1140	early stage of accumulation of 12 feet high shell mound
Curracurrang, N.S.W.	GaK-689	840± 90	AD 1110	latest backed blades
Durras North, N.S.W.	GaK-873	480± 80	AD 1470	specialised bone industry
Glen Aire, Vic.	NZ-367	370± 45	AD 1580	bone industry
Bendemeer 1, N.S.W.	GaK-569	410± 40	AD 1540	latest backed blades
Seelands, N.S.W.	V-26	351± 60	AD 1599	as above
Mt Burr, S.A.	GaK-424	320± 90	AD 1630	as above

Annotations

Chapter I

POBASSOO: Flinders (1814, II:228–34); Perry and Simpson (1962).
MONSOONS: Cense (1952); Earl (1853:197, 1882); Mills (1930:62–7).
TREPANG INDUSTRY: Crawfurd (1820, III:151, 441) and (1856:440); Flinders (1814, II:231, 257); King (1827, I:128–38); Mulvaney (1966a); Searcy (1909)—basic eyewitness account; Wallace (1872:431)—voyaged widely on praus and describes their comfort and speed.
MACASSAN INFLUENCES: Berndt (1954); Thomson (1949); Mountford (1956); Warner (1937:453–68); Worsley (1955).
MACASSANS AND EUROPEANS: Clark (1962); Mulvaney (1966a); Stokes (1846, I:388).
CHINESE: Wei Chu-hsien (1961); Fitzgerald (1953)—includes all earlier references to the figurine; Meilink-Roelofz (1962:25, 87); McCarthy and Setzler (1960:293)—porcelain on Winchelsea Island.
PORTUGUESE: Mills (1930); Pires, *Suma Oriental*, (1944:201–14); Spate (1965); Sharp (1965); Uren (1940:25)—cannons; Earl (1853:210) and King (1827, I:113)—slavery.
DUTCH: Heeres (1899:36, 42, 81, 122–7)—extracts from journals cited; Mulvaney (1958).
DAMPIER: Dampier (1697): entry for 5 Jan. 1688.
WRECKS: Playford (1959); Heeres (1899).
HISTORIC ARCHAEOLOGY: Allen (1967).

Chapter II

HISTORICAL: Phillip—Letter quoted, Mulvaney (1961:56); McCullock (1854, I:250).
POPULATION: Radcliffe-Brown (1930); Meggitt (1962:32, 1964); Stanner (1965); Berndt (1959:86); Birdsell (1957); Hiatt (1968); Mulvaney (1964b); Lawrence (1968).

ENVIRONMENT: C.S.I.R.O. (1960); Strehlow (1965:122–4, 145); Meggitt (1963); Davies (1965); Sturt (1833, I:xiv); Tindale (1959a:40).
POPULATION DYNAMICS: Birdsell (1967).
RACIAL ORIGINS: Abbie (1966:86); Mulvaney (1966b); Birdsell (1949, 1957, 1967); Macintosh (1964); Macintosh and Barker (1965).
GENETICS: Birdsell (1949:117); Simmons (1958:291); Kirk (1965:19); Berndt (1964:12–15)—section contributed by Kirk.
WISSELL LAKES: Graydon *et al* (1958).
WESTERN DESERT: Berndt (1964:14).
TRIBES AND LOCAL GROUPS: Berndt (1959, 1964:28–46); Stanner (1965).
FOOD SUPPLY AND SOCIAL MOBILITY: Eyre (1845, II:252); Thomson (1939); Meggitt (1963, 1964); McCarthy (1939); Hiatt (1968); Lawrence (1968); Bickford (1966); Gould (1967).
CEREMONIAL EXCHANGE: Dawson (1881:78).
LANGUAGE: Wurm (1963; 1965); Oates (1967).
LINGUISTIC ORIGINS: Capell (1956, 1962); Mulvaney (1966b).
MIGRATION ROUTES: Mulvaney (1961:60, 1964a); Macintosh (1965:36–40); Jones (1968).
GLACIATION: Galloway (1963, 1965); Jennings and Mabbutt, ed., (1967:6–11); Gentilli (1961).
CLIMATIC DATA: Jennings and Mabbutt, ed., (1967:172–9)—Central Australia; Darlington (1965:97); Galloway (1963:196; 1965); Butler, in Jennings and Mabbutt, ed., (1967:243–53); Dury (1967); Jones (1968).
PRECIPITATION: Galloway (1965); cf. Jennings and Mabbutt, ed., (1967:5); Dury (1967).
LAKE MENINDEE WINDS: Tedford (1967:20–2).
ARID PERIOD: Gill (1955a, b)—for general exposition and references; Gentilli (1961:490); Tindale (1959a); Merrilees (1968).
BOTANY: Walker (1966:151); Gilbert (1959); Jackson (1965).
SEA LEVELS: Jelgersma (1966); Hails (1965).
LUNETTES: Curtey (1964).
VULCANISM: Jennings, Mabbutt, ed., (1967:157); Hails (1965).

EXTINCT FAUNA: Tedford (1967:4, 17, 149-50); Merrilees (1968); Jones (1968); Tindale (1959a:44); Gill (1955a).
RADIOCARBON INTERPRETATION: Polach and Golson (1966:28-9)—problems of dating; Jennings and Mabbutt, ed., (1967:131)—Lake Callabonna; Tedford (1967:18)—Menindee.
FAUNAL DISTRIBUTION: Calaby and White (1967); Mulvaney *et al* (1964:494, 507); Tedford (1967); Merrilees (1968).
MAN AND VEGETATION: Gilbert (1959); Norman (1963); Jackson (1965); Walker (1966); Jones (1966; 1968); Merrilees (1968).
DINGO: Mulvaney, *et al* (1964); Campbell and Edwards (1966b); Tindale (1959a:44-6).

Chapter III

THOMAS: William Thomas was an Assistant Protector and later Guardian of Victorian Aborigines 1838-60. His handwritten 'Brief Remarks on the Aborigines of Victoria 1838-9' (1859) is in the State Library of Victoria.
DOMESTICATED SPECIES: Meggitt (1965) examines the extent of dingo domestication. Campbell (1965) has assembled evidence which suggests that cassowary birds were tethered in parts of Queensland. But even if this was the first phase of incipient domestication, there is no certainty that this was not a post-European influence.
CAPE YORK: Thomson (1934)—dugong hunters and (1939)—western region; Lawrence (1968). Somerset was visited by the survey ship H.M.S. *Challenger* in 1874. The description was provided by H. N. Moseley, *Notes By a Naturalist*, London 1879:361.
STONE BLADES: Spencer and Gillen (1899:590); Spencer (1928:II, 502); Roth (1907:16); Tindale (1965).
ADZE-FLAKES: Roth (1897:101); Spencer (1928:II, 501); McCarthy (1946:29, 1967, 27); Thomson (1964:418); Tindale (1965:153).
HABITAT AND ECONOMY: Thomson (1934, 1936, 1939, 1964); Meggitt (1963, 1964); Berndt (1964:92); Lawrence (1968).
FOOD STORAGE: Thomson (1936:72, 1939:216, 1964:402); Berndt (1964:99). Campbell (1965) summarises various elementary food-producing activities, but these cannot be deemed horticulture.

DIET: Meggitt (1957, 1963); Thomson (1939, 1964); McCarthy and McArthur (1960); Berndt (1964:93); Roth (1897:91, 1901); Gould (1967); Lawrence (1968).

WEIPA: R.V.S. Wright, report to Australian Institute of Aboriginal Studies, 1963. Mimeographed document 63/83; Thomson (1936, 1939); Roth (1901:1) C14 dates: (I1737) 1715±110 AD, near top of mound; (I1738) 1140±105 AD, near base.

MILINGIMBI: Warner (1937:463); McCarthy and Setzler (1960: 230-44); C14 dates: Macassar Well—V-59, 2370±90 (420 BC) approximately six inches above base; V-60, 2445±80 (495 BC) at the base of the mound.

SOUTH-EASTERN DIET: Eyre (1845); R. B. Smyth (1878, 1:181-252); the evidence for fowling is assembled by Bickford (1966); Lawrence (1968).

VICTORIAN MATERIAL CULTURE: The most comprehensive illustrated account is Smyth (1878); see also Dawson (1881) and the Thomas MS cited above. For a description of stone tools, Smyth (1878, 1:379-86).

POSSUM JAW ENGRAVER: Smyth (1878, 1:349); Spencer and Gillen (1899, 1:144)—tjurunga; discussion with further references in Mulvaney (1961:91), and McCarthy (1967:88); White (1967:163).

POSSUM SKIN CLOAKS: Smyth (1878, 1:271, 349); Eyre (1845, 11:313); detailed description, distribution and illustrations in, Mountford (1963); Mt. William exchange quoted in Mulvaney (1961:87), cf. Howitt (1904:311).

RENIFORM SCRAPERS: Edwards (1963); Campbell and Edwards (1966a:211-14).

ELOUERA: McCarthy (1946, 1967); Setzler and McCarthy (1950); White (1967:474).

BONE AND SHELL TOOLS: Smyth (1878, 1:349-50); Howitt (1904:742); Eyre (1845, 11:313).

BARK CANOES: Smyth (1878, 1:407-22).

VICTORIAN MORES: *Thirteenth Report of the Board for the Protection of Aborigines*, Government Printer, Melbourne, 30 June 1877: 13.

GLEN AIRE: Mulvaney (1962) includes a discussion of the bone implements on other Victorian sites.

FISH HOOK FILES: Lampert (1966); Megaw (1966:39); Roth (1904:33).
COASTAL N.S.W.: Lampert (1966); Megaw (1966, 1967)—both authors describe the ethnographic and ethnohistorical evidence; Wade (1967); Hume (1965); McBryde (1966:428).
FABRICATORS: McCarthy (1946, 1967).
DEVON DOWNS: Hale and Tindale (1930:183).
FROMM'S LANDING: Mulvaney (1960:78); Mulvaney, *et al* (1964:491).
SOUTH-WESTERN AUSTRALIA: Ride (1958); Tindale (1950); Massola (1959); Davidson and McCarthy (1957); Mulvaney (1961:69, 93); King (1827:II, 139-40).
CEREMONIAL EXCHANGE: Howitt (1904:714–19); Roth (1897:229–34); Thomson (1949:53); Stanner (1933); McCarthy (1939); Spencer and Gillen (1899:586); Berndt (1964:106–19).
BALER AND PEARL SHELL: McCarthy (1939); Mountford and Harvey (1938); Stanner (1933:162); Davidson (1949).
ALTERNATIVE FUNCTIONS: Stanner (1933:172); Thomson (1949:64); Gould (1966).
EXPERIMENTAL INNOVATION: Davidson (1935:170); Ride (1958).
DUTCH ETHNOGRAPHY: Heeres (1899:36, 42).
MICROLITHS: McBryde, (1966b:286)—1630 AD ± 80 (GaK-707); 1599 AD ± 60 (V-26).

Chapter IV

HISTORY OF ARCHAEOLOGY: Mulvaney (1961, 1964b) for general discussion, and also quotation of Governor Phillip's report; J. Dawson (1881:104); Statham (1892); Etheridge (1891); Ambrose (1967) for discussion of shell midden research.
DEVON DOWNS: Hale and Tindale (1930); Eyre (1845).
KARTAN: Tindale and Maegrath (1931); Tindale (1937, 1941).
CLIMATE OF OPINION AROUND 1930: Davidson (1935:146); Mulvaney (1957, 1961).
TINDALE SYNTHESIS: For expositions of cultural and racial succession and correlations, see especially Tindale (1956, 1957, 1960,

1961); Tindale and Lindsay (1963). The most detailed criticisms are by McCarthy (1949, 1958b, 1965) and by Mulvaney (1960, 1961).

McCARTHY SYNTHESIS: McCarthy (1948)—Lapstone Creek; McCarthy and Setzler (1960)—Arnhem Land; McCarthy (1964)—Capertee; McCarthy (1965, 1967)—revision of his interpretation.

TERMINOLOGY: Golson (1959); Golson's Australian application, 'Space and Time in Australian Archaeology', is an unpublished paper presented to an Australian Institute of Aboriginal Studies Conference, Sydney, 1963. The report resulting from this conference is published in Mulvaney, ed., (1968).

'HAFTING' PHASE: Mulvaney (1965, 1966c). For criticisms, see White (1967a, b); Jones (1966:5).

KENNIFF CAVE: Mulvaney and Joyce (1965).

JUAN BLADES: Mulvaney and Joyce (1965:190).

ADZE-FLAKES: McCarthy (1946, 1965, 1967); Glover (1967); Davidson (1935:160); Davidson and McCarthy (1957:403); Bandi (1951); Mitchell (1949); Mulvaney (1961:84, 1965:189)—includes additional evidence and discussion, some of which now requires revision.

SHELL DATING: Polach and Golson (1966:29) for difficulties of application.

POINT DISTRIBUTION: Mulvaney (1961:78); Davidson (1934:151, 1935); Davidson and McCarthy (1957:447); Campbell (1960); Tindale (1957:17); Gould (1966); Mitchell (1949); Campbell and Edwards (1966a:198); Flood (1966); White (1967).

MICROLITHIC DISTRIBUTION: Mulvaney (1961:81); Glover (1967); Campbell and Edwards (1966a:204); Coutts (1967).

MICROLITHIC FUNCTION: Mulvaney (1961:82); Gould (1966); McBryde (1968).

MICROLITHIC ANTIQUITY: McBryde (1966a, b); Campbell and Edwards (1966b)—Mt. Burr; Coutts (1967)—Wilson's Promontory.

INDONESIAN TYPOLOGY: Van Heekeren (1957:92–108); Bandi (1951); McCarthy (1940).

ELOUERA: McCarthy (1948, 1964, 1967); Megaw and Glover (1966); Mulvaney and Joyce (1965:188).

BURINS: Mulvaney (1961:90); McCarthy (1964, 1967).

AXES: McCarthy (1946, 1967); Mulvaney (1961:92–5); Tugby (1958); C. White (1967a, b); J. P. White (1967)—New Guinea.

Chapter V

EVOLUTIONARY THEORISTS: Mulvaney (1958:299); Lubbock, *Prehistoric Times*, London, 1865:336.
TASMANIAN DOGS: Plomley (1966:404, 415); T. L. Mitchell (1839, II:347).
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Sources of Illustrations

The following individuals and institutions supplied me with photographs or gave their permission for objects to be photographed, while others took the photographs at my request. Their assistance is gratefully acknowledged.

F. J. Allen: 16, 17; W. R. Ambrose: 8–11, 21–3, 28–9, 31–2, 40–2, 46, 50, 62, 67; R. M. Berndt: 12; D. A. Casey: 18, 20, 43, 48(a), 52, 54, 63, 71–2, 81; I. M. Crawford: 66; R. Edwards: 24–5, 44–5, 51, 55–6, 60–1, 65, 68–70, 73, 76–8, 80; H. Hughes: 74; R. Jones: 49–50, 79; A. Kannon: 57–8; C. C. Macknight: 7, 13; J. V. S. Megaw: 38, 47; J. L. O'Brien: 53; F. B. Smith: 35, 37; W. E. H. Stanner: 26; Mary H. Walker: 36; W. Webster: 48(b–d), 59, 64; Carmel White: 19; G. L. Williams: 18; Admiralty Board of the Defence Council, London: 2; Australian Museum, Sydney: 33, 74; Australian National Library, Canberra: 4, 6; Canberra Community Hospital: 21(a, b), 22(a), 23(a), 42(a); Institute of Anatomy, Canberra: 40, 46; Museum of Applied Arts and Sciences, Sydney: 14; National Museum of Victoria, Melbourne: 21–3, 28–31, 39, 41, 57–8; Navy Department, Commonwealth of Australia, Garden Island Dockyard: 15; Royal Commonwealth Society, London: 1, 3; South Australian Museum, Adelaide: 32, 34; University Museum of Archaeology and Ethnology, Cambridge: 38; University of Sydney, Department of Anatomy: 19

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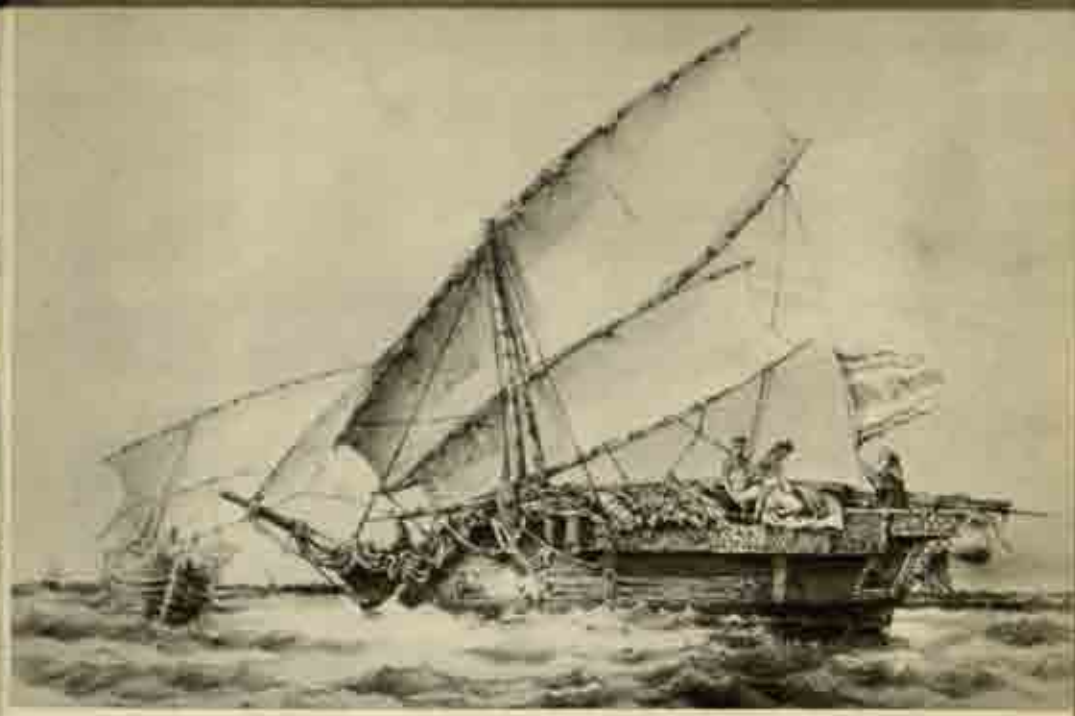

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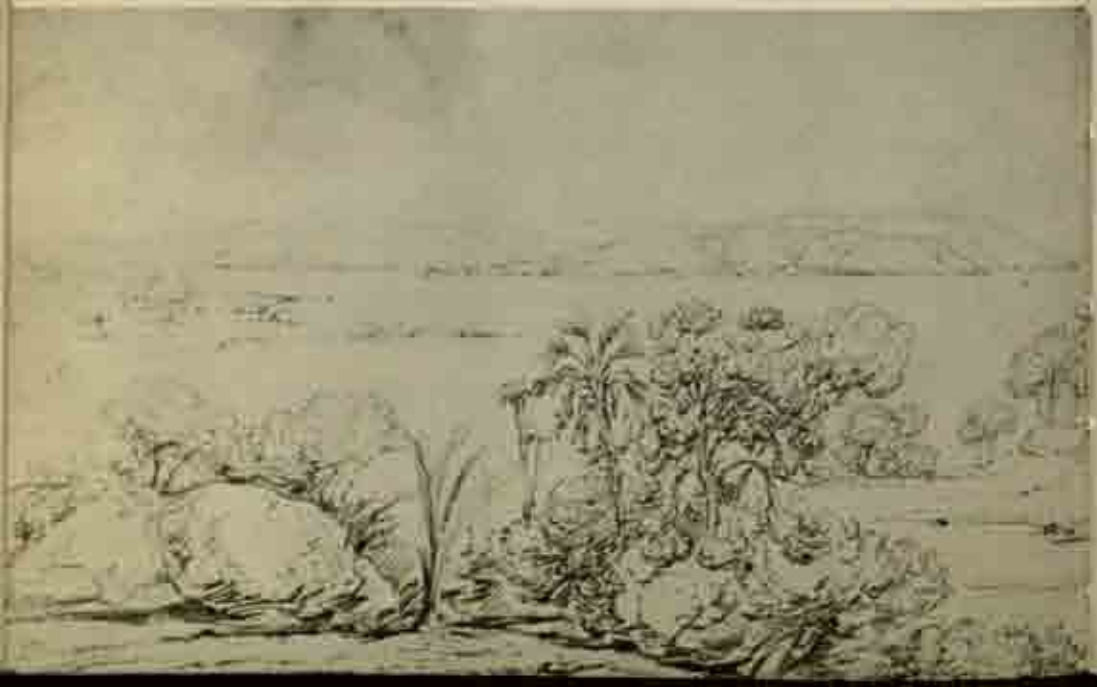

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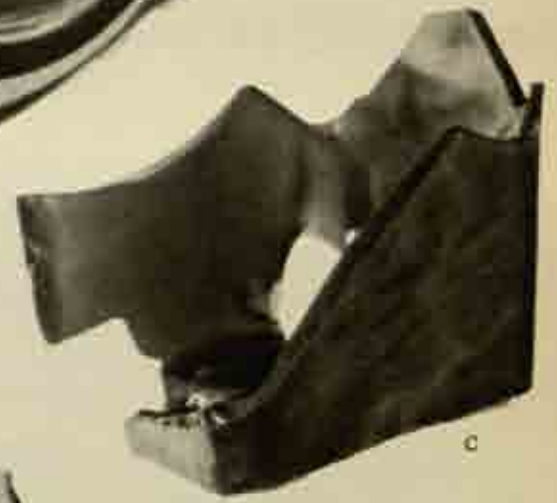

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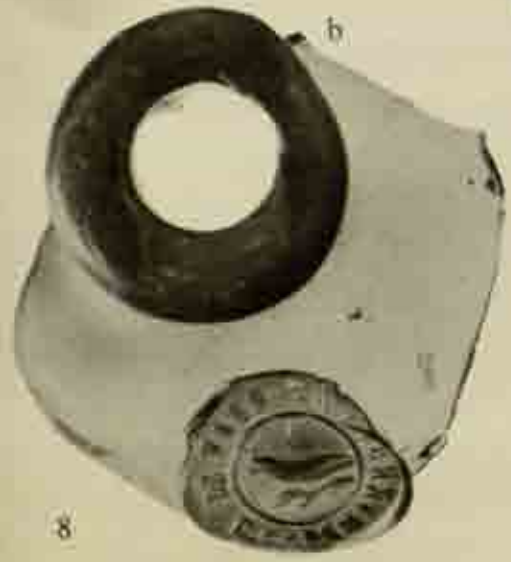

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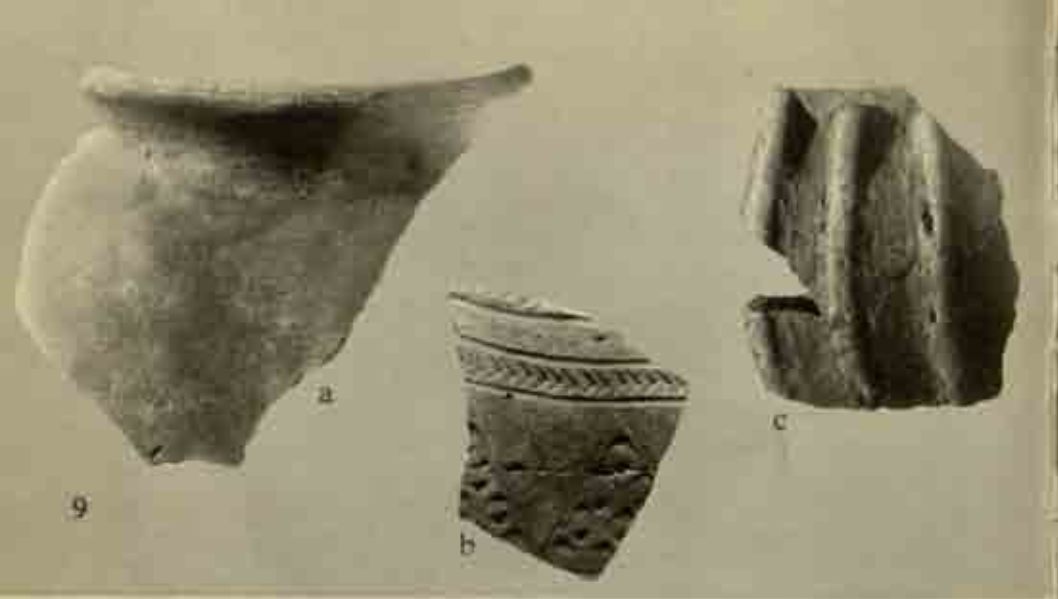
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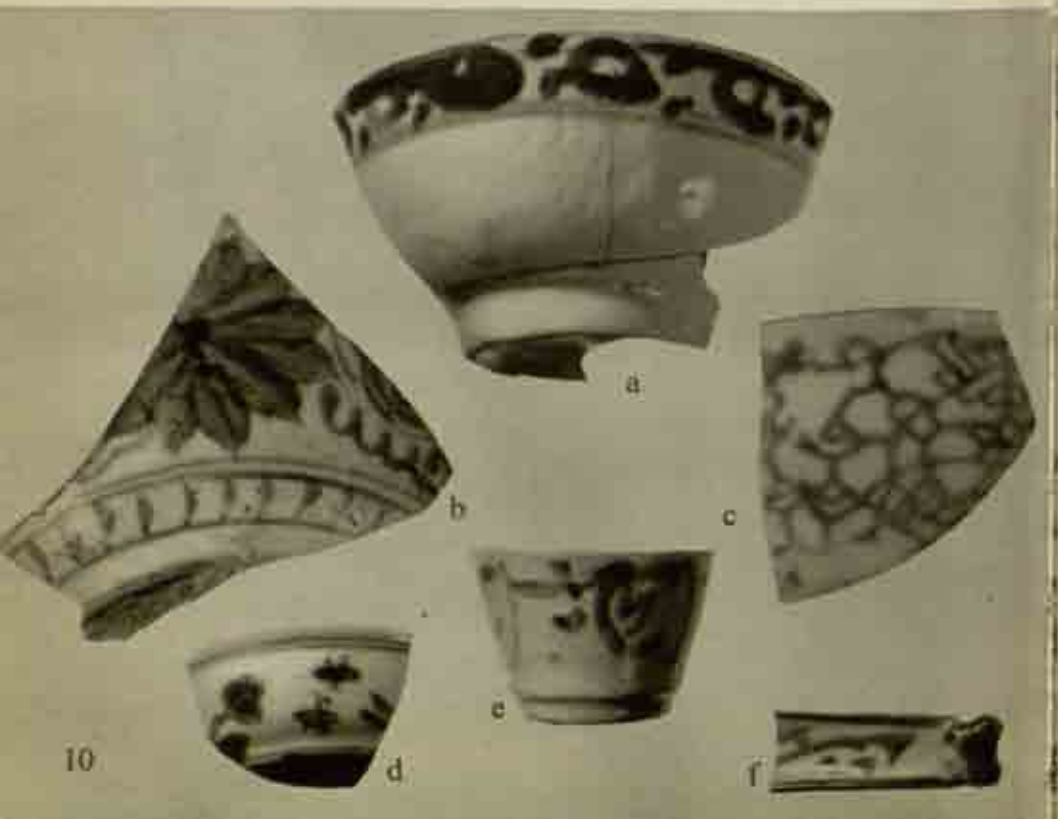
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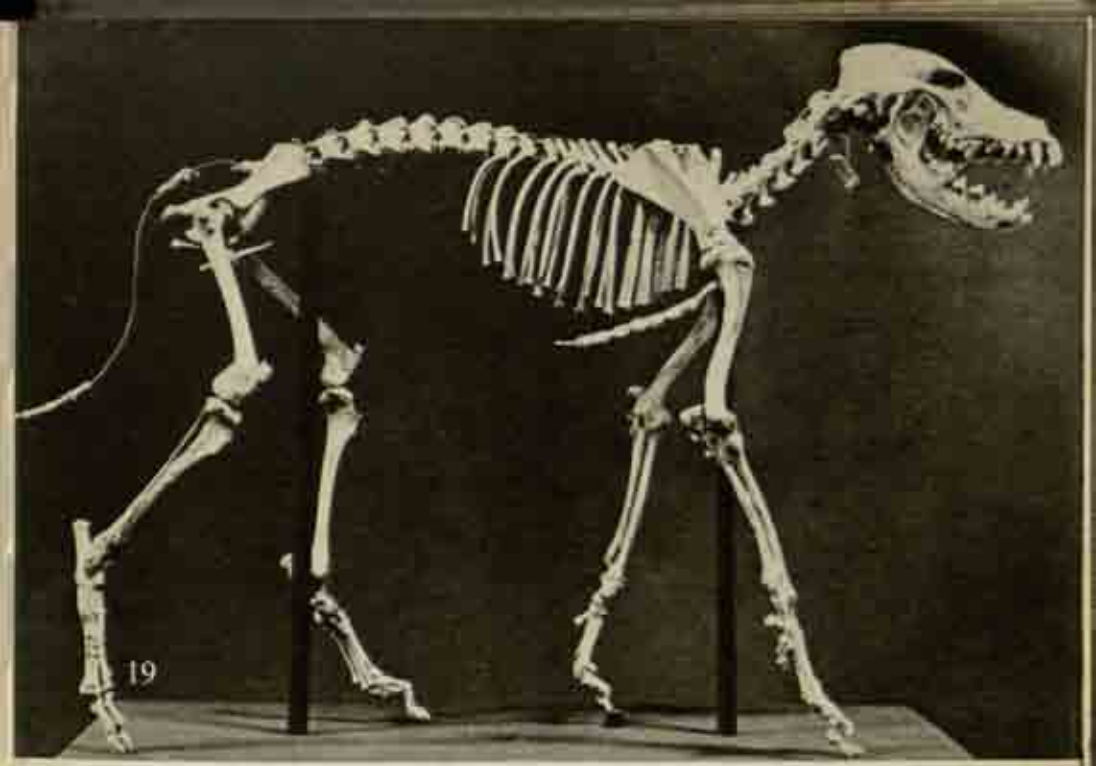

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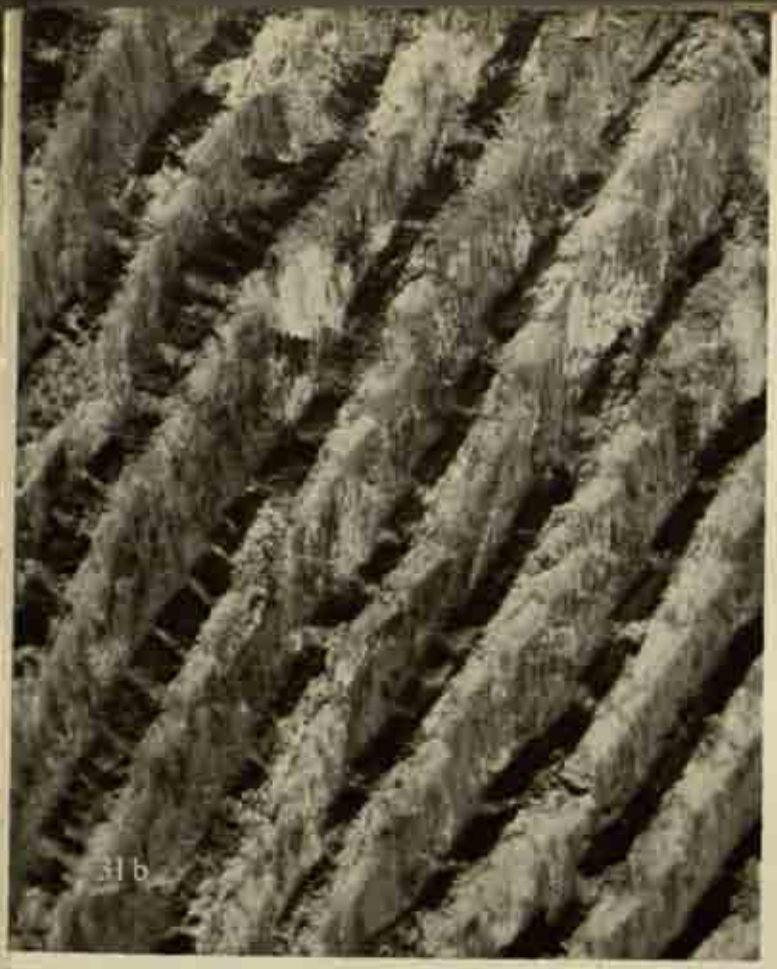

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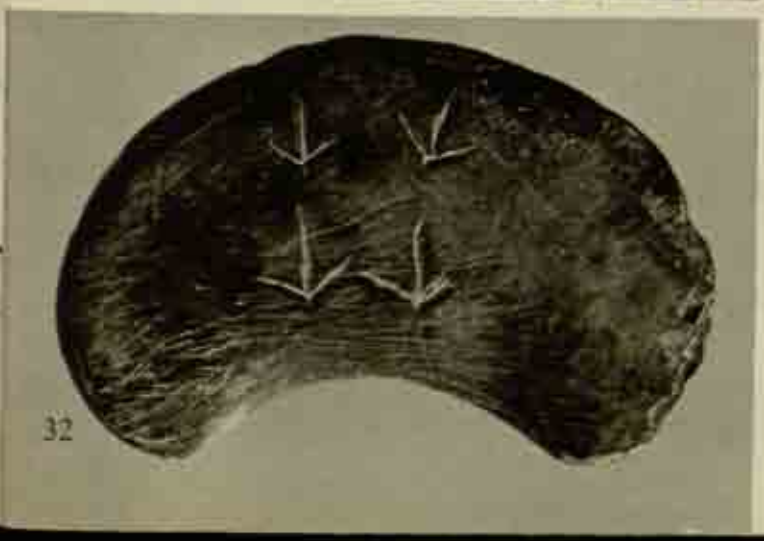

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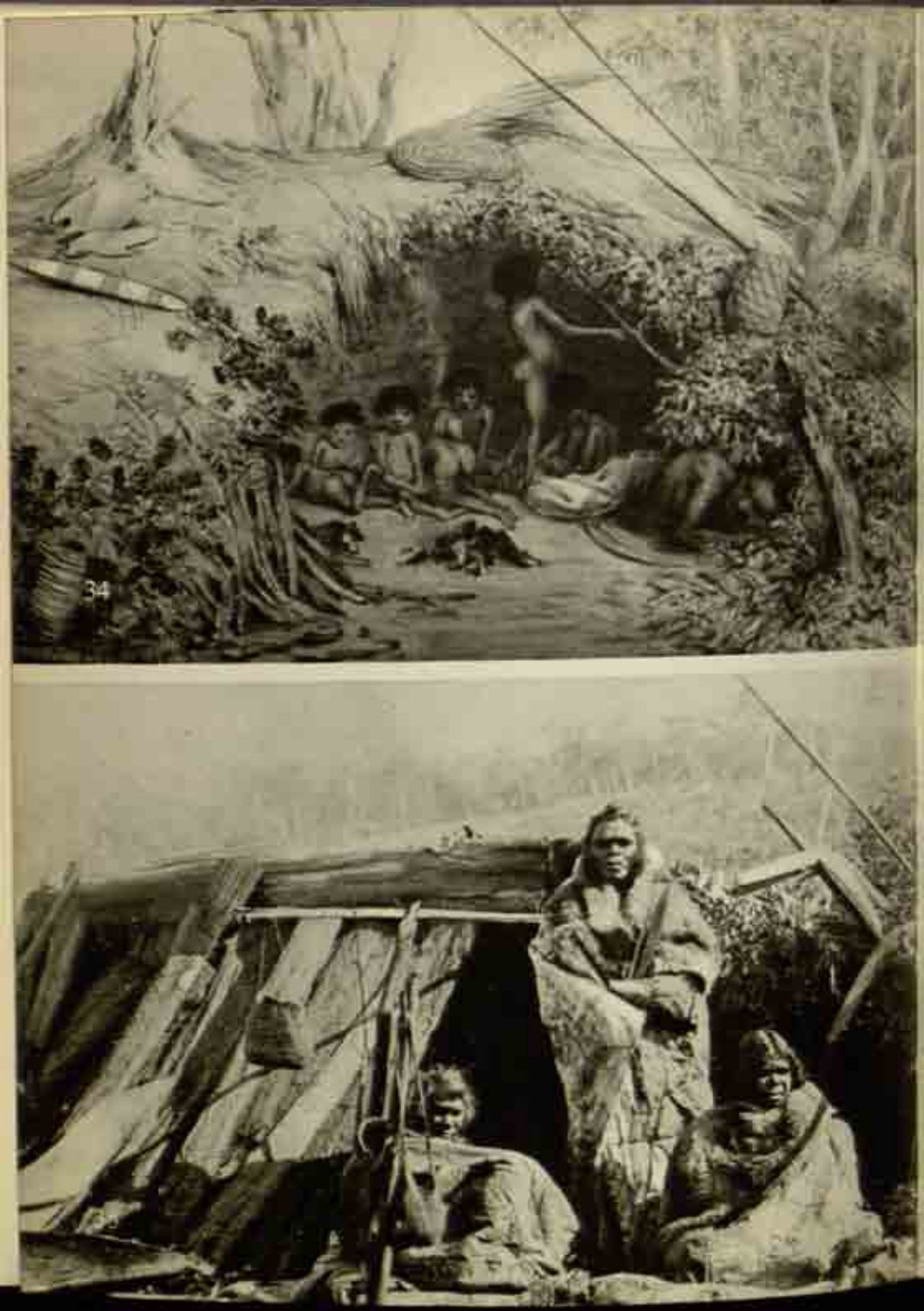

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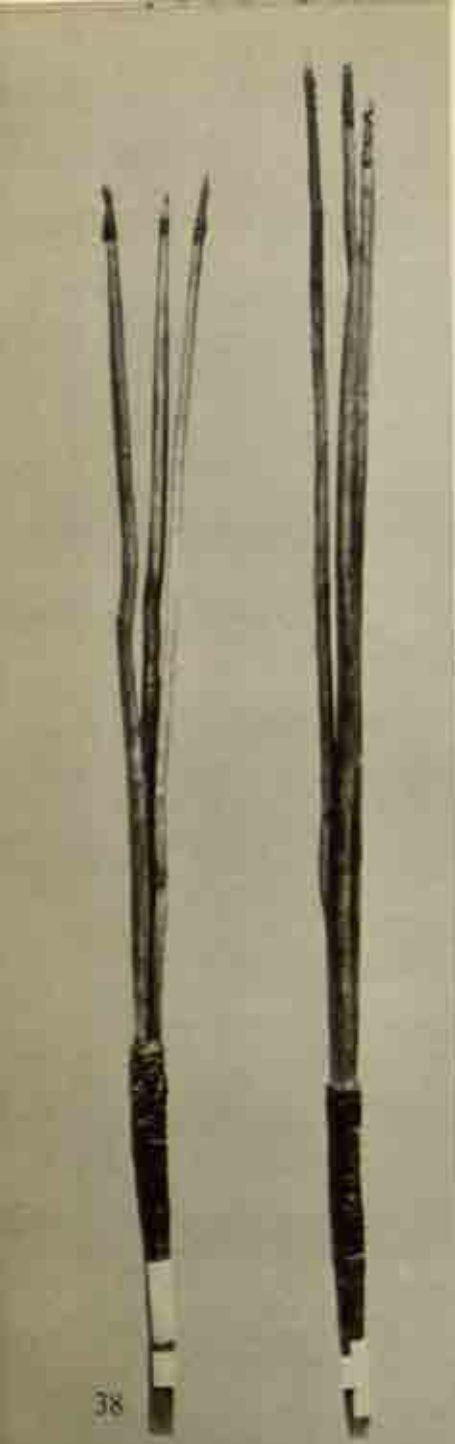

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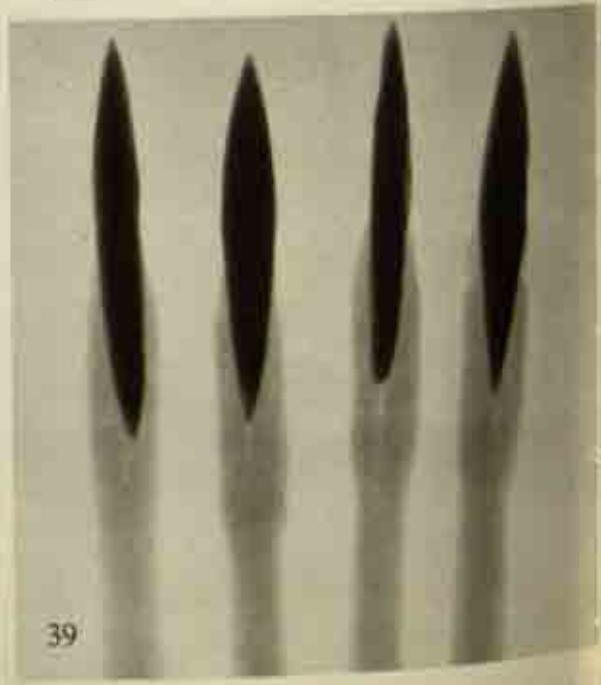

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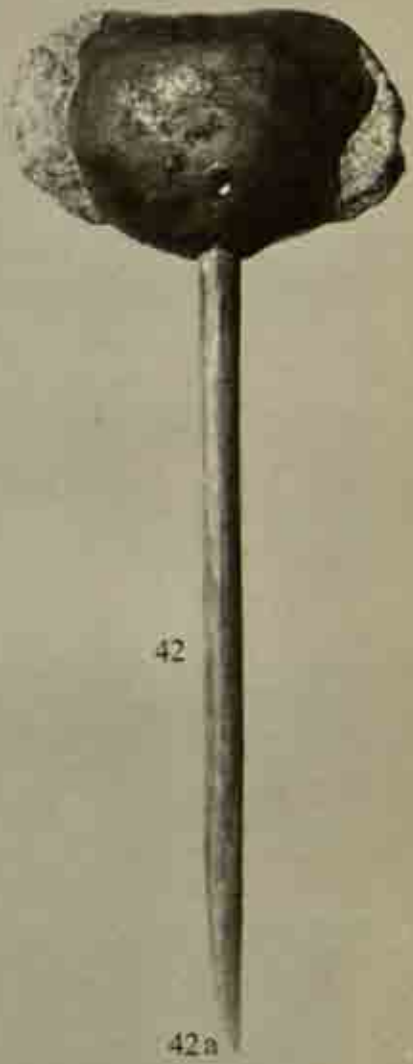

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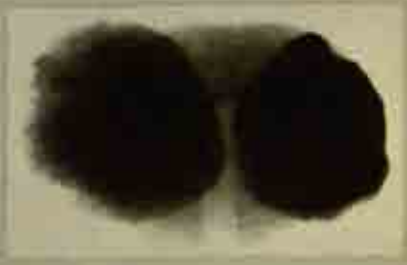

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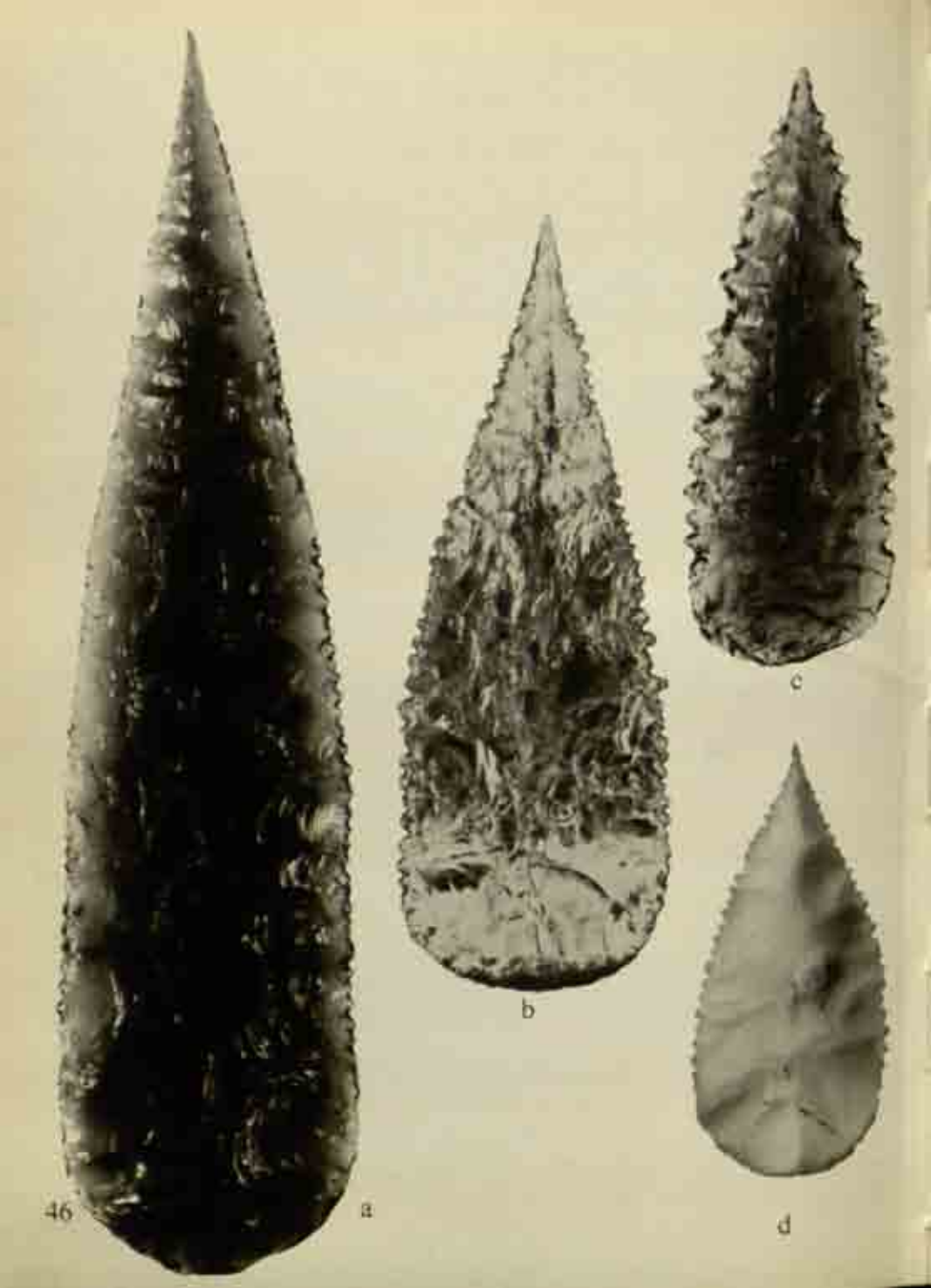
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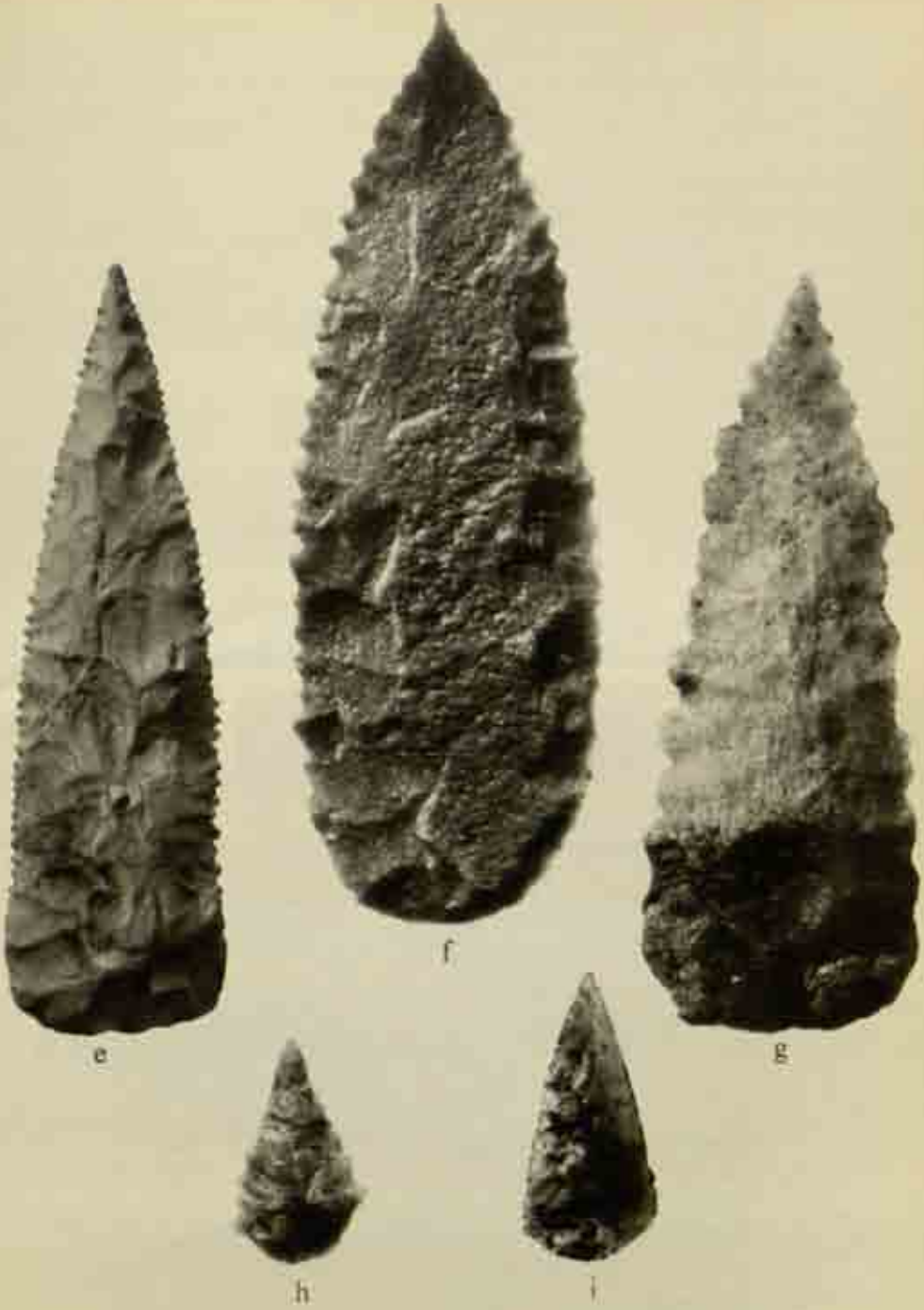
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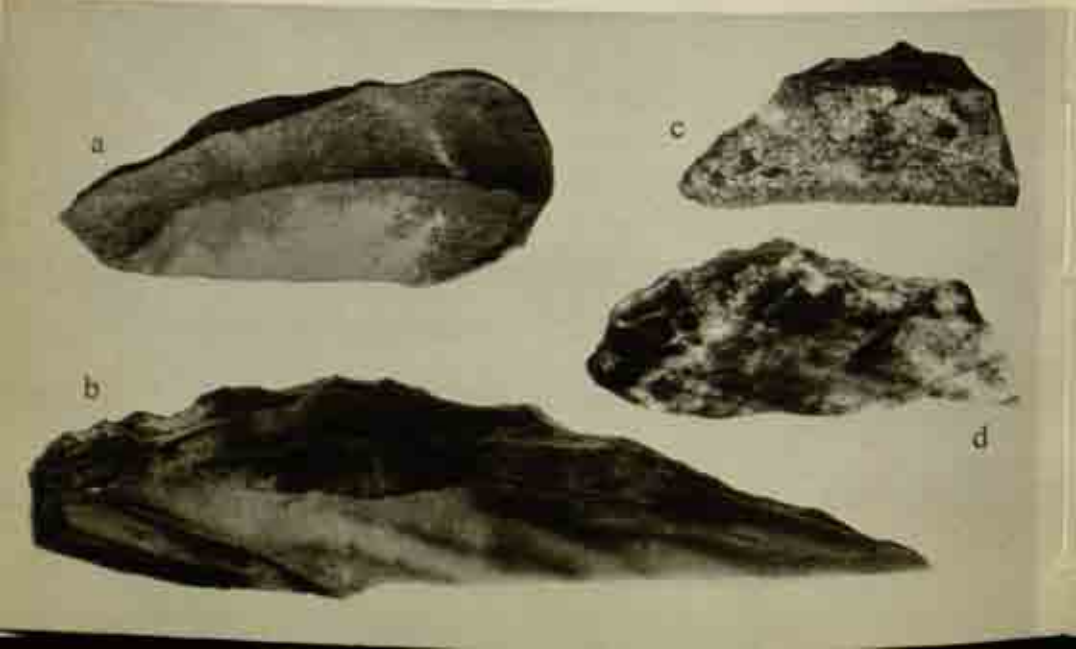

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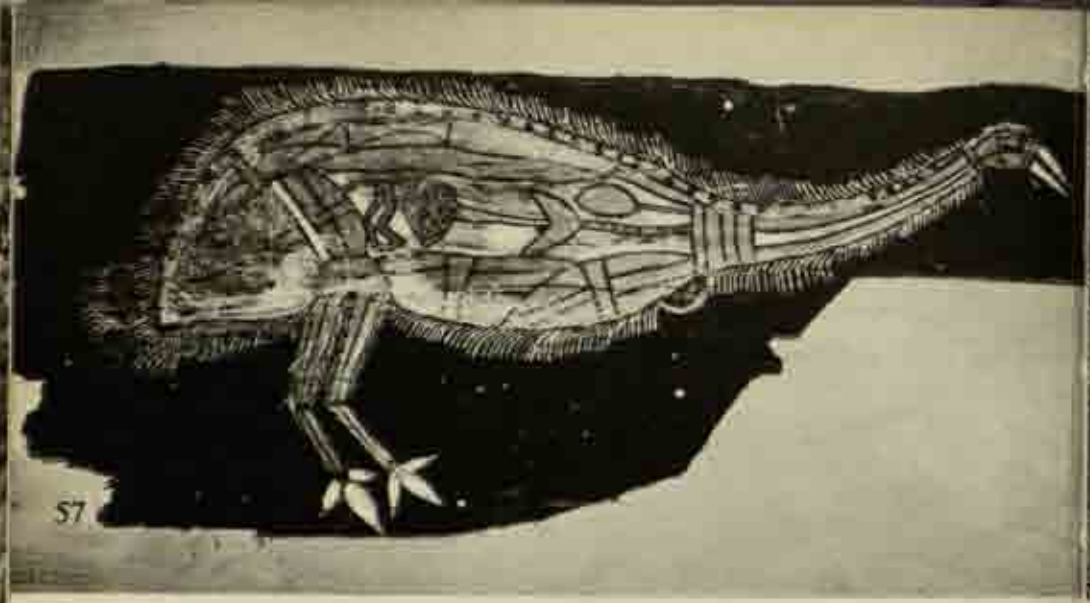

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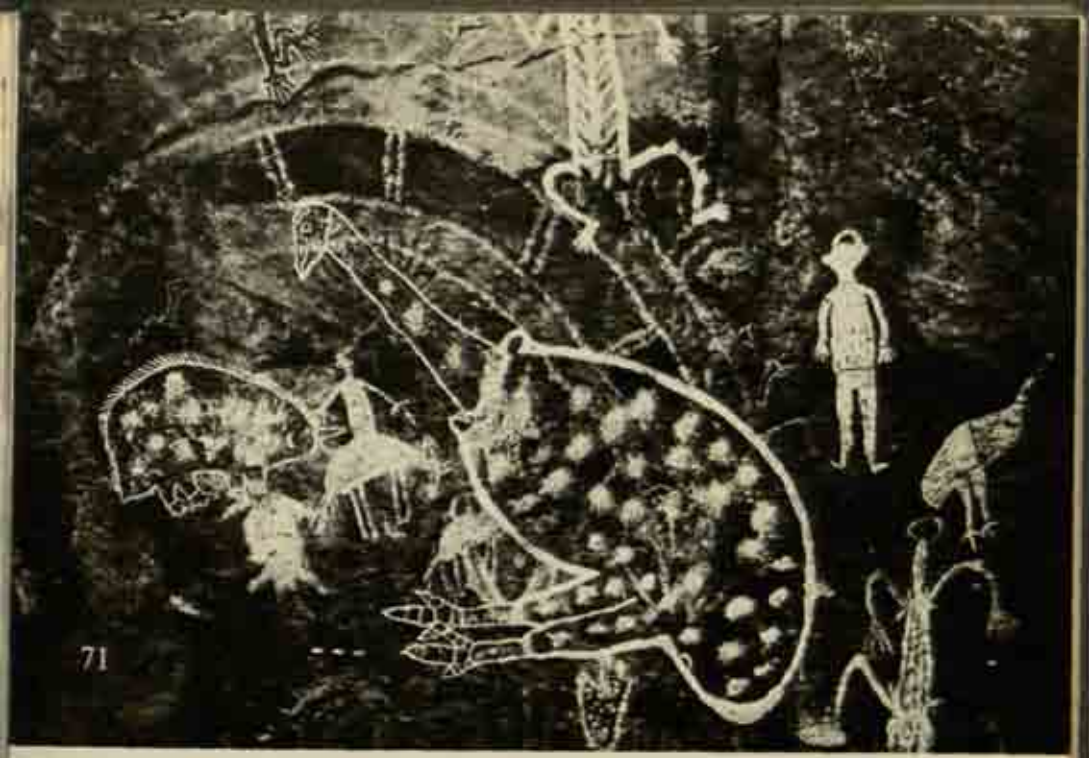

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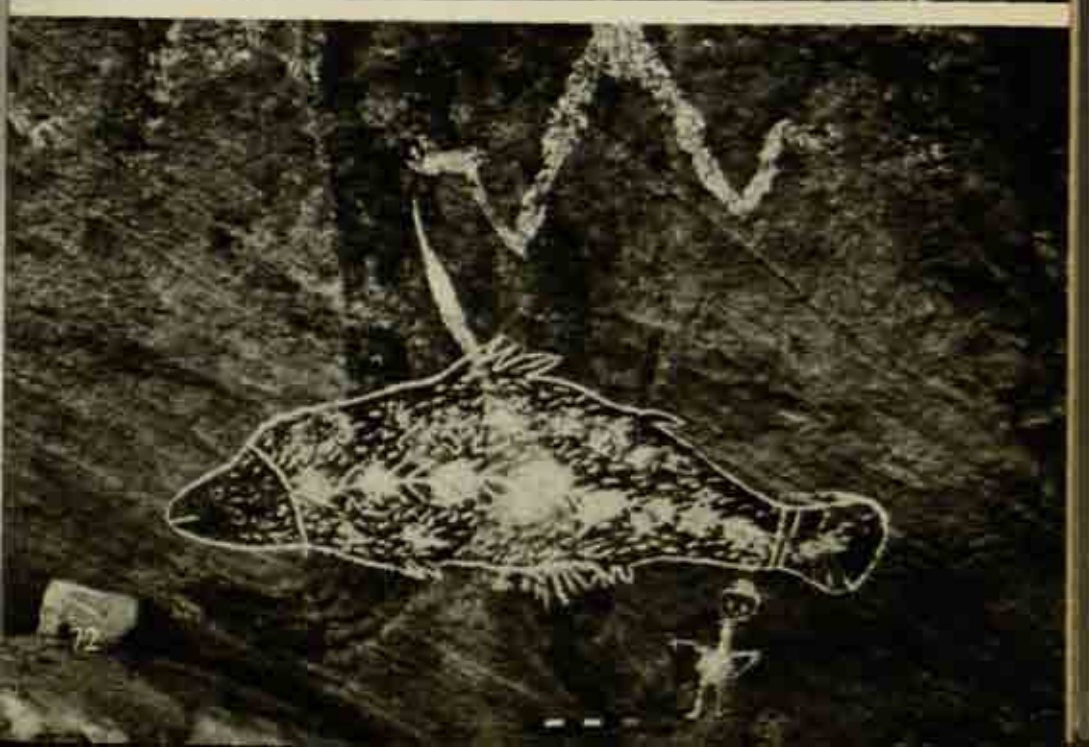

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Notes on the Plates

1 'Probasso, a Malay chief', a pencil sketch, 7 × 11 inches, by William Westall, 1803. 'Probasso' was spelt Pobassoo by Matthew Flinders, who thus named one of The English Company's Islands in his honour. Pobassoo was on his seventh or eighth voyage to Australia in twenty years; on one of them he was speared in the leg by Aborigines. Flinders found him of an enquiring and helpful disposition, and presented him with a bottle of port wine. Pobassoo sits outside the cabin of his prau. (Reproduced, with permission, from Perry and Simpson (1962), no. 111).

2 *View of Malay Bay from Pobassoo's Island*, oil painting, 33¾ × 23½ inches, by William Westall. The dramatic quality is enhanced by the dark clouds and the vivid red cloak blowing in the wind. The engraved version was reproduced by Flinders (1814, 11:233). The Macassan fleet, drawn separately by Westall, has been superimposed upon the sketch reproduced above. Note the characteristic tripod masts of the praus. (Perry and Simpson, 1962; reproduced by permission of the Admiralty Board of the Defence Council).

3 Malay Road, The English Company's Islands, a pencil sketch, 11½ × 7½ inches, by William Westall, 1803. This was painted on Pobassoo Island, looking across the strait towards Cotton Island. Westall also sketched the praus and the *Investigator* moored in the shelter of the strait. (Perry and Simpson (1962), no. 107).

4 Macassan praus, Raffles Bay, 1839. Just after British marines established the settlement of Victoria, in Port Essington, a French expedition led by Dumont d'Urville sailed into Raffles Bay, two harbours further east. This vivid representation of the Macassan trepangers in these waters was provided by Louis Le Breton, third-class surgeon on *L'Astrolabe*. Dumont d'Urville (1841–6: *Atlas Pittoresque*, 2, pl. 114).

5 Macassan trepanging site, Anuru Bay, Arnhem Land, looking west across the Bay. The large tree near the end of the peninsula is an introduced tamarind. The sandy beach is on the right shore and the mangroves, source of fuel, fringe the left shore. A well-preserved stone line is visible in front of the tamarind tree; a grassy depression in the right centre (just behind the bush on the right) was the site of a smoke-house. Two burials were found in the sand near by. The entire visible land surface, which had been fired by Aborigines shortly before the photograph was taken, was littered with potsherds.

6 The trepanging industry, as depicted by Le Breton at Raffles Bay, 1839, during the visit of Dumont d'Urville (1841–46: *Atlas Pittoresque*, 2, pl. 115). The scene is idealised, although the essentials are portrayed: there are two lines of stone hearths near the water, with large iron cauldrons in which the trepang were boiled; the long huts are presumably unfinished bamboo and rattan smoke-houses; trepanging operations are in progress on the bay. At least twenty-four men are figured in the scene.

7 Part of a Macassan line of stone hearths, Lyaba site, on a small island off the north coast of Groote Eylandt. This line, which was one of the largest on the site, had seven bays for boiling cauldrons.

8 a, Glass bottle prunt collected at Anuru Bay. This was a product of J. H. Henkes distillery, Rotterdam, and the prunt is in the form used during the period 1845–90.
b, Bottle top and prunt, collected on a sandbank on South Goulburn Island, a few miles from Anuru Bay.
c, Square-faced bottle base, from a Macassan site on Entrance Island, at the mouth of the Liverpool River, Arnhem Land; internal dimension: 7 cm. square.
d, Base of round, dark green bottle from Port Essington (1838–49) which was trimmed and used as an Aboriginal implement. This type was a common find in F. J. Allen's excavations there.

9 a, Rim of red, globular Macassan pot, Anuru Bay. This form is the commonest on all sites, with sizes ranging from small to somewhat larger than this vessel, which was approx. 15·5 cm. in diameter across the rim.

b, Stamp impressed red ware from Macassan site, Melville Bay, Arnhem Land. Max. height, 4·5 cm. The site from which it came is actually indicated on Plate 12, near the bottom of the right-hand corner of the drawings.
c, Sherd from a small globular pot with vertical ribbed decoration, Anuru Bay. Max. height, 6 cm.

10 Selected porcelain fragments from Arnhem Land Macassan trepanging sites. The maximum widths of these sherds are as follows:
(a) 10 cm.; (b) 8·5 cm.; (c) 5 cm.; (d) 4·1 cm.; (e) 4·5 cm.; (f) spoon handle: 4·2 cm. long.

11 a, Obverse and reverse of a copper doit of the Dutch East India Company, dated 1780, and excavated by C. C. Macknight, on a Macassan trepanging site on an islet off the north coast of Groote Eylandt. Diameter, 2·1 cm.
b, Bronze fish-hooks from Macassan sites: *left*, from a South Goulburn Island sandbank; length, 3 cm.; *right*, from Lyaba Island, north of Groote Eylandt; length, 5·3 cm.
c, Clay pipe bowl, Entrance Island, Arnhem Land. Found with Macassan pottery within the roots of a tamarind tree. The pipe is European.

12 Brown paper crayon drawing, by Mauwulan, of Melville Bay, in north-eastern Arnhem Land, during the time of Macassan contact. The long peninsula on the right is Point Dundas, while the large central promontory is Drimmie Head. Praus are sailing in the harbour; the trees are possibly tamarinds. Drimmie Head was an island until a causeway was built during the Second World War. Note that trepanging camps are illustrated on both sides of this promontory; there are stone lines, potsherds and tamarinds in this area today. Note that other trees are also chiefly situated on islands, where Macassans camped for protection. The large island on the extreme left is probably Bremer Island, renowned for its turtles. The Macassans also collected turtle shell. Mauwulan drew this picture for R. M. Berndt (1954: plate 5) around 1946. Since that time, bauxite deposits have been found near by and there are plans to build harbour installations inside Melville Bay.

13 Aboriginal stone arrangement, or 'picture', of a Macassan prau, near Cape Arnhem, Arnhem Land. Over several hundred square yards of this coastal site, small ironstone rocks have been arranged in what Aborigines claim are models of fish traps, outlines of praus, houses and small models of trepang boiling hearths. The large wooden steering oar of the prau is in the right foreground. This recent discovery sheds further light on the extent of Macassan influence upon Aboriginal society.

14 Soapstone carving of Shou Lao, Taoist immortal, found beneath a banyan tree in Darwin, 1879. Height 12 cm.

15 Brass cannon, found on Carronade Island in Napier Broome Bay, by Captain Cumberlege, R.N., H.M.A.S. *Encounter*, 1917. Length over-all: 43 inches; bore $1\frac{5}{8}$ inches; markings: crest surmounted by a crown. A second cannon of the same dimensions but different design was also recovered, but it bears no markings. The carriage upon which it is mounted is modern.

16 Stone chimney and wall, Victoria settlement, Port Essington, 1838–49. There are five such chimneys standing near the cliff top, which provided the southern walls of cottages used as married quarters of this Royal Marines settlement. They are identical to the most simple type of Cornish round buttress chimney, whose distribution was originally thought to be restricted to west Cornwall. The Magazine is the only intact stone structure preserved at the settlement, although the solid hospital kitchen stands to roof height.

17 Excavation of Store D, Port Essington, looking north. Bricks were manufactured from local clay, and excavations showed that the sandstone and brick foundations were quarried and laid horizontally with great precision. The building was of two storeys, chiefly wooden, and the ground floor consisted of compacted shelly material. Excavations at Port Essington have contributed important data concerning early colonial architectural techniques.

18 Looking upstream at shelter no. 2, Fromm's Landing, South Australia, towards Devon Downs rock shelter, ten miles away. The limestone

cliffs defining the Murray valley in this region are up to 100 feet above the river and they contain numerous rock shelters. Excavations here in 1956 and 1958 reached a depth of about seventeen feet, and human occupation extended back some 5000 years.

19 Skeleton of male dingo (*Canis familiaris dingo*) from shelter 6, Fromm's Landing, reassembled by N. W. G. Macintosh and B. Bailey, Department of Anatomy, University of Sydney. The remains were six feet below the surface and date to between 1000±91 BC (NPL-28) and 1220±94 BC (NPL-29). Analysis of this six-month-old animal indicates that dingo morphological pattern has remained unchanged for 3000 years. Length of assembled bones, 65 cm.

20 Fromm's Landing, shelter no. 6, section through the excavation of 1960 and 1961. These stratified layers contained a rich collection of faunal remains, including the dingo skeleton, which was excavated to the left of this view, at about the level of the top of the ranging pole. Note the sudden termination of layers immediately to the right of the topmost two feet of this pole. This was caused by flood water erosion around 1000 BC. Measurements show that this flood reached a level higher than that attained in any recorded historic flood. A small 'cliff' was left by the receding water; deposition resumed, as the higher layers covering this interlude indicate.

21 Detailed photograph of a tula adze-flake set in resin—Porcupine grass or spinifex (*Triodia spp.*), or grass trees (*Xanthorrhoea spp.*). Length from base of resin: 13 cm.; National Museum of Victoria, no. 13487; collected Tennant Creek, Northern Territory.

21a X-ray photograph of the same tula, showing how little of the stone flake projects into the adhesive. Note the distinctive angle of the butt (striking platform) end, which is the hallmark of a tula adze-flake. The darker specks are due to the presence of grit in the resin.

21b X-ray of the opposite end of the same tula, showing that although it is a smaller (and narrower) flake, suitable for engraving work, it possesses the distinctive tula adze-flake butt. It is this type which the craftsman in plate 25 is using.

22 Close view of one end of a Central Australian tula adze, with use-modification far advanced. Note the step-flaked margin. Indeed, both the working edge and the butt end have been used and worn, and the stone is now a narrow, pointed remnant, which has been reset, with the pointed end serving as the working edge. Presumably, the regular fluted decoration on the adze handle was made with such a tool. In McCarthy's classification (1946), this is a 'burren' adze. The fact that a standard tula adze-flake is mounted in the other end of the tool, suggests that this flake also began its working life as an orthodox tula flake. National Museum of Victoria, no. 49871; total length of implement 72 cm.

22a X-ray photograph of the same flake (opposite side view), confirming that the flake is long, narrow, and lacks the obtuse angled striking platform of a tula adze-flake.

23 End of a Central Australian spear-thrower with a rough adze-flake set in the end (*cf.* the spear-thrower in plate 24). This is not a tula adze-flake, but simply a roughly shaped stone, which use-modification renders undistinguishable from a 'burren' flake. National Museum of Victoria, no. 50569. Length of resin and flake: 3·5 cm.

23a X-ray photograph showing the rough flake, set in resin on a knobby end of the spear-thrower.

24 Two Walbiri tribesmen near Yuendumu, Central Australia, return from a successful hunting expedition. Weapons were few in number and portable. Note the multi-purpose shield and spear-thrower held by the leading man. With the exception of a stone set in resin on the spear-thrower, all implements are wooden.

25 Walbiri man from Yuendumu using a tula adze, with characteristic two-handed grip, working towards the user. As in this example, the handle was usually curved. The man is using the smaller of the two end-hafted adze-flakes.

26 Shell midden at Weipa, Cape York. Note the height of the mound above the flat landscape.

27 Garrki shell mound, Milingimbi Island, Arnhem Land. This mound of loosely piled cockle and other marine shells, together with much charcoal, apparently accumulated to a height of more than 20 feet in about 1500 years.

28 Edge-ground chisel, Victoria. Nat. Mus. of Vic., no. 12617. Total length: 19·5 cm.

29 Taap saw-knife, collected in south-western Australia during the nineteenth century. Nat. Mus. of Vic., no. 810. Total length: 22 cm. The five hafted teeth are untrimmed quartz fragments.

30 Possum-jaw engraving tool, collected in Victoria and illustrated by R. Brough Smyth in 1878, as the type specimen of a 'leange-walert'. Nat. Mus. of Vic., no. 1556. Total length: 17 cm. The end of the incisor is fractured, presumably through use.

31 A Victorian wooden parrying shield, possibly ornamented by using a possum-jaw engraving tool. This weapon was amongst early holdings of the National Museum of Victoria (no. 1814). Note the irregular lines, as compared with the stone incised flutings on the tula illustrated in plate 22. Note also, that the detailed photographs indicate that small pieces were literally dug out of the wood in individual units 3 or 4 mm. wide. Brough Smyth (1878, 1: fig. 129) illustrates a similar example of workmanship. Length of shield: 70 cm.

31a,b Enlargements of portion of the shield.

32 Reniform slate scraper, with surface markings, including presumed emu tracks. South Australian Museum, no. A21340; found at Findon, S.A. Length 11·8 cm., breadth 6·3 cm.

33 Hafted clouera found in a rock shelter on Arguluk Hill, Oenpelli, 1948. The working edge of the stone component is untrimmed, but it is use-polished. As it is side-hafted, it is functionally different from end-hafted adzes. Length of implement: 35 cm. Australian Museum, Sydney.

34 George French Angas, water colour 'Miami, Portland Bay', 1845. From the original in the South Australian Museum. The long object, centre left, is a parrying shield (*cf.* plate 31).

35 Aboriginal group, Coranderrk Aboriginal Station, Healesville, Victoria, *c.* 1879; photographer: 'Fred Kruger (Gold Medallist) of Geelong'. Note the possum-skin cloaks, worn reversed, with cross-hatched scorings on individual skins.

36 Aboriginal ceremony, photographed near Baimsdale, eastern Victoria, by A. W. Howitt, probably 1884. This ceremony is almost certainly the Jeraeil, described by him (1904: 616–37). The actual incident is possibly related on p. 629. The figure standing with arm raised, at left, was Tulaba, one of Howitt's chief informants; he was probably whirling a bull-roarer.

37 Eucalypt bark canoe, Coranderrk Aboriginal Station, *c.* 1879; photographer: Kruger. Note the skin cloaks (Compare plate 56).

38 Two trident fish spears, presumably collected by Captain Cook and Sir Joseph Banks at Botany Bay, in 1770. Lord Sandwich donated them to Trinity College Library, Cambridge in 1771, and subsequently they were lent to the University Museum of Archaeology and Ethnology, Cambridge. The shafts have been sawn off, and the prongs average about 60 cm. in length. The points consist of fish spines or marsupial bones. The enlargement (plate 38a) suggests that one at least is a bone bi-point, held firm with grass fibre and resin. Further documentation in Megaw (1967a: 287).

39 X-ray of quadruple-pronged fish spear collected by W. Baldwin Spencer at Oenpelli in 1912. Note the thin cracks in the wooden prongs, into which the bone bi-points were inserted. Length of left hand bone point 5·3 cm. (Nat. Mus. of Victoria, no. 19363).

40 Perforated baler-shell pendant (*Melo diadema*) collected near Lake Eyre, at Mungeranie, South Australia. Horne-Bowie Collection, Australian Institute of Anatomy, Canberra, no. A.S. 16. Length: 10 cm. Some shells have linear decoration on the concave face.

41 Perforated and incised interlocking key design pearl oyster shell ornament, Kimberley coast (precise provenance unknown); length: 17 cm. Nat. Mus. of Victoria, no. 50678. Geometric designs of this type are the most common motif, although naturalistic decoration occurs, while other pendants are plain. When rubbed with red or black pigments (this specimen is coloured with red ochre) the designs stand out in striking contrast to the natural lustre of the shell. Examples range from 5 to 20 cm. in length. Excavations should reveal their antiquity; Davidson (1949) infers the origin of interlocking key and meander patterns in Indonesia, where comparable designs occur on prehistoric pottery.

42 Kodj granitic axe, collected by John Forrest, near Bunbury. The left-hand stone shows some use polish, but neither stone possesses secondary trimming. Total length: 23 cm. Nat. Mus. of Victoria, no. 840; date of cataloguing, 1890.

42a X-ray of the same specimen, showing method of hafting and rough nature of the flakes.

43 Kenniff cave, Mt Moffatt station, Queensland. The excavation during the 1962 season, looking into the sandstone cave. The ranging pole is marked in feet. The change from 'non-hafted' flake tools to 'hafted' microliths and points occurred about the top of this pole. The light bands represent periods of less intensive human occupation. The age of the double band above the pole is about 2500 years, while level with the bottom of the pole, occupation was dated as 13,000 years old. Further towards the camera, the deposit was 11 feet deep. The final excavation was almost three times the volume of this trench. Note the negative stencils of hands and a foot (above left trench wall) on the rock surface.

44 Ingaladdi, site no. 1, Willeroo Station, Northern Territory. The southern aspect of this Pre-Cambrian, cross-bedded, sandstone shelter ensures that parts of its level sandy floor are always shaded. In addition to its significance as a major gallery of engraved and painted art, it is possibly the richest Australian site excavated in the density and number of stone implements recovered.

45 Ingaladdi, site no. 1, the 1966 trench. The maximum depth of occupation at the rear end of this trench was over seven feet, and the site was first occupied about 7000 years ago. Note the change in deposition from angular sandstone fragments in the lower section to even, sandy material in the upper portion. The change was distinct, but represents the passage of about 2000 years (3000 to 1000 B C). Only flake and core tools occur within the rubble; point and tula adze-flake industries predominate in the sandy deposit. Note the deep engravings (mostly of human feet) on the shelter wall. Linear markings occurred on fragments within the lower rubble, including the nearest large rock projecting from the trench wall, on the left.

46 Kimberley bifacially trimmed and serrated-edged points selected to show variant finish. Institute of Anatomy, Canberra.

a, A.W.H. 233, green bottle glass; length: 13 cm.
b, A.W.H. 138, clear bottle glass; length: 8·2 cm.
c, A.W.H. 130, green bottle glass; length: 6·5 cm.
d, A.W.H. 264, white porcelain (telegraph insulator); length: 4·6 cm.
e, A.W.H. 267, grey chert; length: 7·5 cm.
f, A.W.H. 228, pink quartzite; length: 8·9 cm.
g, A.W.H. 214, white quartzite; length: 7·4 cm. Resin covers two cms at the butt end.
h, A.W.H. 266, grey chert; length: 2·18 cm.
i, Personal coll., pale chert; length: 2·9 cm. Butt end is resinous; tip projected less than 2 cm., and was painted white; minute serrations.

47 Curracurrang rock shelter, Royal National Park, south of Sydney, in Hawkesbury sandstone, facing east and positioned 250 yards from the shore line. Human occupation extended throughout the four feet of deposit, which has accumulated during some 7500 years. Backed blade implements occur only in horizons dating approximately between 410±90 B C (GaK-688) and A D 1110±90 (GaK-689). The uppermost two feet consists of shelly material, in which fabricators, elouera and fish-hook files predominate. The site is typical of numerous sandstone shelters along the N.S.W. coast.

48 Evidence for hafting on prehistoric backed blades.
a, Bondi-point, excavated from level 2, Fromm's Landing, shelter no. 2 (Mulvaney, 1960:79). Length: 2·2 cm. (the tip is broken). A dark stain extends over and along the retouched thick edge. Although chemical tests proved inconclusive, it is probable that the stain is resinous.
b, Bondi-point, excavated at Graman rock shelter by Dr Isabel McBryde; cat. no. GB4-84; Area B, site 4, trench 1, zone (a), Level II. Length: 4 cm.; gum extends over the retouched back, for the entire length. A radiocarbon date for this level centres around 340 B.C.
c, Geometric microlith, excavated at Graman; cat. no. GB1-449; Area B, site 1, trench 2, zone (c), Level II, spit 1. Length: 1·5 cm.; gum extends over part of the abruptly trimmed back, and in for almost 3 mm. The radiocarbon age of this level centres around 800 B.C.
d, Geometric microlith from the same horizon as (c); cat. no. GB1-448. Length: 1·9 cm.; gum extends in a curve over the artifact, resembling the stain on (a). All specimens may have served as barbs.

49 West Point, Tasmania. Excavations in the Aboriginal middens, 1964–5; scale in feet. This midden accumulated between the first and eighth centuries A.D. and contained enormous quantities of Southern Elephant Seal bones.

50 Rocky Cape South cave, Tasmania. A detailed view of the surface of the cavity sealed for about 4000 years. The floor is in an undisturbed condition: the central space was fairly clear (foreground) and shells, bones and artifacts were heaped around the walls. W. R. Ambrose photographed a stereoscopic series covering the entire surface, which was then excavated by Rhys Jones. Note the number of *Notohaliotis ruber* (Abalone or mutton-fish).

51 The Gallus site, Koonalda cave, Nullarbor Plain, South Australia. Part of the 1967 excavation by R. V. S. Wright. The trench reached almost 22 feet below the cave floor. The top six feet consisted of limestone rubble, and evidence of human occupation, dating from 14,000 to 19,000 years ago. This view shows the lower deposit, consisting of red laminated lacustrine sediments—gravels, silt and clay—periodically

washed into the cave from the Nullarbor Plain. Artifacts were sparse, but faunal remains were well preserved; no giant marsupial species were represented. Radiocarbon estimations imply that these sediments accumulated rapidly over a few hundred years, but further work is planned. A date of around 30,000 years was obtained for a hearth immediately overlying the sediments, and this inversion is under investigation.

52 Skeletal remains, Green Gully, Keilor, Victoria, August 1965. The remains were uncovered and partially removed by a front-end loader working in the soil pit. (The line of disturbance is the vertical face along which the scale lies.) A preliminary description of these remains by Macintosh (1967) indicates that the bones of two individuals (upper portion, female: lower limbs, male) were represented in this 6000-years-old delayed burial.

53 The site of the Keilor cranium, Keilor, Victoria. This portrays a rescue operation begun by the author in 1962. The vertical wall had been cut through the Keilor terrace sediments to divert a stream (off to the right) into the Maribyrnong River (on left), to enable commercial quarrying. A flash flood while archaeological work was in progress swept the deposit under investigation into the river (Mulvaney 1964a). The provenance of the 1940 cranium discovery was near the seated figure (the floor of the 1940 quarry). E. D. Gill's radiocarbon date of 18,000± 500 years (NZ-207) was collected six feet lower down, approximately beneath the standing figure, centre. A core implement was found protruding from the cutting wall near the figure at the left, at about his waist level. The subsequent Gallus excavations are to the right of this photo.

54 Kintore limestone cave, Northern Territory. General view of the 1963 excavations. Two depositional phases are evident: accumulation of fine, compact, red clay, which later dried and cracked; dry dust powdered (as under present conditions) onto this cracked surface, penetrating the cracks (see plan and sections of these cracks in the trench). There were no point-tools in the red clay, but they were numerous in the upper dusty layer. Note the deep grooves on the large flat rocks in the foreground. There is ethnographic evidence that these markings were associated with rain-making ceremonies.

55 Canoe tree, with footholds cut up the trunk, at Mannum, twenty miles down the Murray River from Fromm's Landing. The scar left by the removal of the canoe bark is on the right. Because this tree was dead and in danger of destruction, a 36-foot length was removed in 1967. It will be re-erected in the South Australian Museum.

56 Walbiri tribesman from Yuendumu, Central Australia, removing bark from a ghost gum to make a container. The large quartzite chopper was a selected piece with sharp edges. The bark was levered off the trunk and trimmed by biting it into shape. Compare the bruised outline with the clean edges on the Coranderrk bark hut and canoe, presumably fashioned with steel axes (plates 35 and 37).

57 Bark painting, Western Arnhem Land, X-ray style. Donated to National Museum of Victoria by W. Baldwin Spencer in 1913. Register no. 19877; dimensions: 66 in. (167·6 cm.) × 27 in. (68·6 cm.). Colours: red and white; black eyes and gall-bladder. Spencer's catalogue description follows: 'Kopereipi, an emu. The details of the internal anatomy of the bird are clearly indicated. Along the back runs the backbone. In the neck the oesophagus is shown with flesh on the under surface. The shoulder girdle and muscles on it are represented by cross-bands of red ochre. Behind these the alimentary canal is shown, with the heart above it. On the former there is, first of all, a bilobed structure representing the liver, with the gall-bladder indicated by a black mark. A little further back is the gizzard, followed by the intestine. On the under-surface, just below the neck, there is a solid mass of red ochre representing the "tai", or, as the natives said, "the place where it talked". The three characteristic toes are clearly indicated.' (*cf.* plate 71).

58 Victorian bark drawing 33 in. (83·8 cm.) × 22 in. (55·9 cm.) dating from the 1860s. The bark is badly warped and cracked and the designs have faded (it is only 17·5 in. (44·5 cm.) wide across the curve). It is reproduced because of its historic interest: it is probably one of the two oldest bark drawings in existence (the other, also from Victoria, is in the British Museum), and it comes from the south-east, whereas bark drawing is now restricted to Arnhem Land. A fairly accurate reproduction is given in Smyth (1878:1, 286), where Smyth stated that it

came 'some years ago' from Lake Tyrrell, in north-western Victoria. The bark is smoked black and the design has been etched, or gouged out; some areas have been roughened. The design includes representation of many items of traditional material culture—weapons and watercraft—together with two rifles (centre, right) and a squatter's homestead (bottom right). It accords with the style of Victorian rock art in the Grampians ranges. National Museum of Victoria, no. 1520.

59 Carved eucalypt (stringybark), with design partly covered by re-growth. Foster's Hill, Bootolong, west of Armidale, New England. Many trees have larger and more impressive designs, but this one was chosen because it exemplifies the difficulties of field preservation of this type of antiquity. Evidently cut with a steel axe, it is already in an advanced state of decay. It presumably marked a burial site.

60 Aboriginal stone arrangement, Great Victoria Desert, South Australia. View of the northern portion of the central section of the site.

61 Arrangement of crocodile bones on the floor of a painted rock shelter in Djuaun tribal country at Sleinbeck, Western Arnhem Land. Two other shelters in this area have great numbers of bones piled on their floor. Arndt (1962b:305) describes one of them as a 'Sickness Place', where an annual ceremony occurred, to which each participant brought an animal bone; (Arndt was probably in error in stating that human bones were involved). Site 2, Ingaladdi, Willeroo station, contained a number of emu skulls in 1963, but by 1966 these had been disturbed by visitors. Circles of kangaroo bones formed part of the Ubar ceremony in parts of Arnhem Land; the bones were stored in readiness for use at the ceremony.

62 Carved cypress-pine trees and an Aboriginal grave, discovered by Oxley, 29 July, 1817, near the Lachlan river. Oxley (1820:110), who excavated a grave two weeks earlier, continued his antiquarian interest here (pp. 138–41). He described the mound as being five feet high; the scene as portrayed in this illustration looks idealised, but his verbal account is in close agreement with it. The grave contained the body of a man wrapped in possum skins and bark, but work was suspended overnight 'as the corpse became extremely offensive to the smell'. The trees were

about fifty feet from the grave, 'the sides towards the tomb were barked, and curious characters deeply cut upon them, in a manner which, considering the tools they possess, must have been a work of great labour and time.'

63 Red stencilled human figure at The Tombs, Mt Moffatt station, southern Queensland. A group of 'mutilated' hand-prints is in the small cave on the left. The third arm does not seem to belong to an earlier, superimposed human figure.

64 Axe-grinding grooves beside Sheep Station Creek, near the Gwydir River, at Bingara, west of Armidale, New England, New South Wales.

65 A Walbiri tribesman at work grinding an axe-head in a diorite quarry near Yuendumu, Central Australia. Discarded flakes can be seen in the foreground. The process of dry grinding to produce an effective cutting edge was carried out intermittently over a number of weeks.

66 The Wandjina figure seen by George Grey in 1838, on the wall of a rock shelter on the Glenelg River in the Kimberley region, north-western Australia. The site is described by Crawford (1968).

67 The same Wandjina figure drawn by Grey (1838, 1:202) on 26 March 1838. During the following century speculation was rife concerning the origins of this art style, partly because Grey's rendition was dramatic and one figure was embellished with 'writing'. Egyptian, Assyrian and Hindu artists were all invoked. It is now established that the style is explicable within the context of Aboriginal myth and ceremonial.

68 Ingaladdi, site 3, Willeroo Station, in the Wardaman tribal area, Northern Territory. Two large human figures, wearing elaborate head-dresses and carrying stone axes. The larger (and most recent) figure is almost 10 feet tall and has yellow limonite between the white lines, while the second figure is coloured with red haematite. As the sandstone wall curves outwards, the paintings have an almost three-dimensional appearance. There are striking similarities between these paintings and the well-known Lightning Brothers, at Delamere, more than 30 miles

south, but also in Wardaman territory. Delamere has been described by Arndt (1962a) as a rain-totem centre, where hundreds of abraded grooves testify to rain-making ceremonies. (*cf.* plate 77).
The stylistic and symbolic portrayal of these inland figures owes much to Kimberley Wandjina influence.

69 Rock paintings at Cave Hill (Owalinja), Musgrave Ranges, in the extreme north of South Australia. This large and spectacular shelter is under a granite dome, and its walls and ceiling are covered with superimposed paintings, chiefly in red, yellow, white and black pigments. Tindale (1959b) made a detailed study of the mythological content of these paintings. They centre round the activities and far-flung journeyings of a creation-time totemic ancestor, Njiru, who became identified with stars and constellations. The basic motifs were painted prior to 1915, when their tribal 'owners' were displaced by Pitjandjara people. This photograph covers about 4 feet by 3 feet, and the largest figure at least, depicts Njiru, painted in black and outlined in white. It is interesting that these figures are mouthless, like the Wandjina figures, while the concentric designs about the head are also reminiscent of that style (Compare also, plate 68).

70 A droving scene, in a sandstone rock shelter a mile west of Ingaladdi water hole, Northern Territory. A snake (the Rainbow Serpent?), beneath it. This area was first penetrated by Europeans during the 1880s. The Rainbow snake is prominent in mythology over immense areas and is a frequent art motif.

71 Ingaladdi, site 1, a group of European-influenced white paintings superimposed on older red, yellow and white drawings. Note the two revolvers to the left of the standing 'bowler-hatted' man. The white figure at the top is in 'X-ray' style, while the faint red figure overlain by the 'cowboy' and the emu's neck suggests the style of plate 68, a site less than a mile away.

72 Painting of a fish in 'X-ray' style at Ingaladdi, site 1. This is one of the most distant recorded examples of this style from its centre in western Arnhem Land (*cf.* plate 57).

73 In Central Australia, elaborate ground drawings were an integral part of many ceremonies. Walbiri ceremonies at the impressive emu totemic centre at Ruguri, near Yuendumu, include the preparation of an extensive ground painting, depicting the journey of the mythical emu in creation time. The walls of the shelter are covered with similar designs. The ochre was mixed in a spear-thrower and applied with a stick. The concentric circle motif is prominent in Central Australian art; it was represented to a minor extent at Ingaladdi, 500 miles north of Yuendumu.

74 Superimposed paintings at Wimbar (Iona station) near Louth, Darling River, western N.S.W. Both the simple 'match-stick' human figures and infilled naturalistic animal paintings are characteristic of many sites throughout south-eastern Australia, including Victoria, where art sites are rare.

75 Red ochre negative stencils of hands and a large boomerang, on white quartzitic sandstone, in the Chesterton Range, near Emu Bends station, Queensland, south-west of The Tombs site. This is an excellent example of a technique which was almost universal in Australia, but predominated in southern Queensland.

76 A gallery of engravings was recently discovered by Mr Michael Terry, in the sandstone Cleland Hills, some 200 miles west of Alice Springs. The outlines of many of these figures have been pounded, in a series of linear punctures, which were subsequently connected. Of the 387 designs, only 16 are of human faces.

77 Abraded or incised grooves on quartzitic sandstone, Delamere River Ranch rock shelter, Northern Territory. Area: approx. three feet by two feet. Believed to be associated with rain ceremonies, the purpose was to cut the rock and make it 'bleed'. Little more than 50 miles north, excavations at Ingaladdi, site 1, recovered fragments of engraved rocks, with comparable linear markings; their age was between 5000 and 7000 years.

78 Petroglyphs at Mootwingee, western New South Wales. Pecked intaglio designs in sandstone of men, boomerangs and emu tracks. The

pounding and puncturing process represented here and in plate 75 contrasts with the abraded grooves illustrated in plates 54 and 77, and with the linear finger impressions and scratchings in plates 80 and 81.

79 Rock engravings, Mt Cameron West, north-western Tasmania. Abraded designs in soft, yellow dune limestone, within a few yards of the ocean beach. Similar motifs were described by G. A. Robinson in 1833, at Green's Creek, a few miles south of this site.

80 Australia's oldest known 'art'? Finger markings and linear grooves covering thousands of square feet on the soft limestone walls of Koonalda cave, Nullarbor Plain, South Australia. They are in total darkness and partly buried by an ancient rock fall.

81 Scratches on the wall of Kintore cave, Northern Territory. Similar markings are associated with the engraved art in Koonalda cave. Their grouping suggests animal claws, but many of them are in inaccessible places. Some believe that they must have been humanly held paws; certainly they are restricted in their occurrence.

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