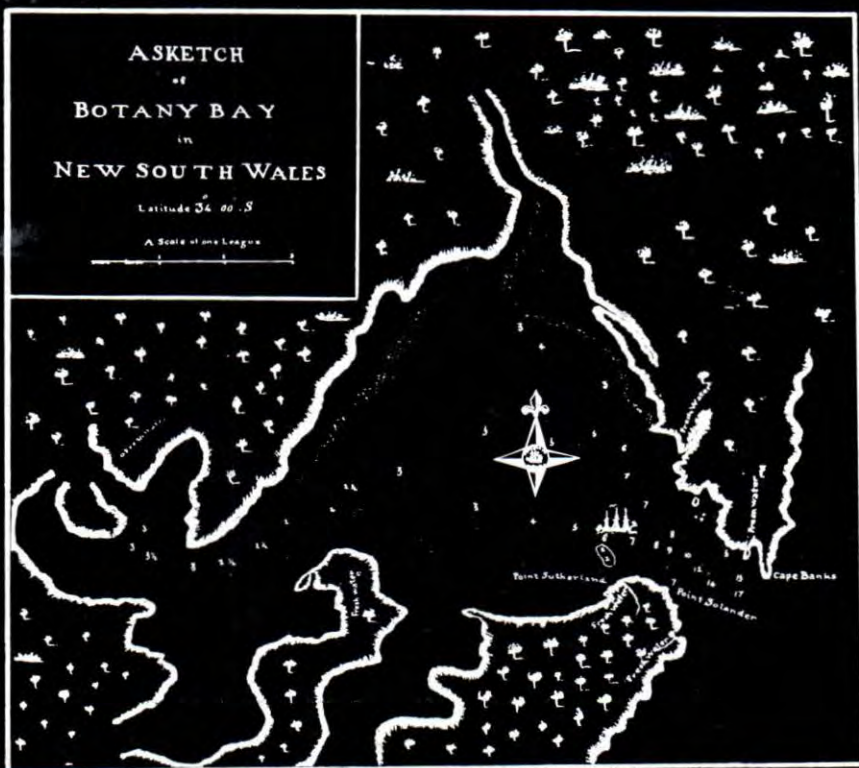


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CAPTAIN COOK ISSUE



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This issue marks the bicentenary of Captain James Cook's landing in Australia in 1770. It contains 16 extra pages.

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● FRONT AND BACK COVERS: Two hundred years of development of the Botany Bay area show in this comparison between Captain Cook's sketch map, which he prepared from his own charts, and a modern aerial photo. Of the landscape that Cook beheld little remains; man's activities have changed all except the coastline and the contours of the bay itself. The aerial photo is by courtesy of Adastra Aerial Surveys.



CAPTAIN JAMES COOK, R.N., F.R.S. (1728–1779)

This portrait of the great navigator and discoverer of eastern Australia was painted by Nathaniel Dance in 1776, and is in the National Maritime Museum, Greenwich, England. As the portrait suggests, Captain Cook was of impressive appearance, being over 6 feet tall and of strong physique.



The *Earl of Pembroke*, the Whitby collier which was refitted and commissioned as the *Endeavour* for Cook's voyage to Australia, leaving Whitby harbour. [Painting by Thomas Luny in the collection of the National Library of Australia, Canberra; reproduced by permission of the National Librarian.]

CAPTAIN COOK'S ROLE IN NATURAL HISTORY

By PETER J. WHITEHEAD

Ichthyologist, British Museum (Natural History), London

I have given the best account of things in my power. I have neither had an education, nor have I acquired abilities for writing. I have been almost constantly at sea from my youth and have draged myself . . . through all the Stations, from a Prentice Boy to a Commander.—Captain Cook.

TO say that James Cook, R.N., F.R.S., was a product of his age is not to belittle his tremendous achievements. A Yorkshire farm-labourer's son who could soar from such humble origins to become not only a national hero but a figure of international standing—and this in an age when the command of a naval vessel so frequently depended on birth and social position—a man of this calibre would surely

succeed in any age. He was described by one of his contemporaries as "the most able and enlightened Navigator that England ever produced", and, with Drake and Nelson, he stands as one of the three most famous seamen in British history. The mid-eighteenth century offered an enormous breadth of opportunity to those with ability, a scope that was to be drastically reduced by the middle of the next century as a

result of specialization in almost every field. In the mid-eighteenth century, however, it was still possible to sail where none had sailed before, to chart quite unknown coasts, even to search for an unknown continent, and at the same time to almost inevitably contribute to other fields of human endeavour. Thus, James Cook was not merely the discoverer of new lands; he was also the man who first defeated scurvy on British ships, he laid the foundations for scientific hydrography and oceanography, he was a brilliant and courageous navigator, and he left his mark as a great humanitarian. He is also remembered for the part he played in bringing back to England the most comprehensive and best documented assortment of plants and animals yet collected from the vast Pacific area. This was a tremendous achievement, owing its success as much to Cook's mastery of seamanship as to the energy and enthusiasm of that dominant figure in the early history of Australia, Sir Joseph Banks (1743–1820).

The expedition that set sail from Plymouth at 2 o'clock in the afternoon of 26th August, 1768, had a number of unusual features. In the first place, the ship was a converted Whitby collier, the *Earl of Pembroke*, renamed *Endeavour Bark*, broad in the beam and of shallow draught. Placed in command of this ship, and only shortly before raised to commissioned rank, was Lieutenant James Cook, almost unknown except to a few astute men at the Admiralty who had been impressed by the thoroughness of his surveys of the St Lawrence and the coasts of Newfoundland. Alexander Dalrymple, geographer and scholar, who had fully expected to be given the command, had been passed over in favour of the former Whitby seaman, to Dalrymple's lasting chagrin. It was Cook who chose *Endeavour* in preference to one of the East India Company's ships, a frigate or one of the large three-decked West Indiamen—a choice that was to be fully vindicated by subsequent events.

Aims of the voyage

The object of the voyage was ostensibly to observe and to record the transit of the planet Venus across the disc of the sun from the newly discovered George III

Island, soon to be known as Otaheite (Tahiti). Measurements of the previous transit in 1761, from which a more accurate calculation of the distance of the earth from the sun could be made, had proved disappointing, and the Royal Society was anxious that this expedition would be successful. The King placed £4,000 at the disposal of the Society, and Charles Green was appointed official astronomer.

However, Cook also had secret orders. After the observations on Tahiti he was to proceed southwards to latitude 40° S. and to investigate the possible existence of a southern continent, the *Terra australis incognita* that geographers such as Buache, and especially Dalrymple, believed must exist to balance the land masses of the Northern Hemisphere. Politically, the discovery and colonization of such a continent would be an important triumph for England in her struggles with France—hence the secrecy of the orders.

Finally, there was a third aspect to the voyage, the investigation of the natural history of the Pacific region. The Royal Society had presented to the Lords of the Admiralty a memorandum urging them to include in the expedition "Joseph Banks, Esq., Fellow of this Society, a gentleman of large fortune, who is well versed in Natural History . . . together with his suite . . .". A fortnight before *Endeavour* sailed, Banks and his retinue were granted permission to join Cook on the voyage. Banks entirely financed this side of the voyage, reputedly to the extent of £10,000. What is more important, however, is that Banks set a precedent for the official recognition of naturalists on British voyages of discovery and many young men benefited from this enlightened policy, including the most famous of all, Charles Darwin.

Banks' team

Banks, whose education included Harrow, Eton, and Oxford, and whose personal income amounted to some £6,000 a year, was principally a botanist, but had a wide range of interests. Finding that Humphrey Sibthorp, who held the chair of botany at Oxford, had managed only a single lecture during his career, Banks imported his own tutor from Cambridge. At 23 Banks voyaged to Newfoundland in HMS *Niger*

to study natural history, and in the same year he was elected a Fellow of the Royal Society. Learning of the *Endeavour* expedition, he lost no time in persuading the Society to allow him to participate.

Banks chose his companions carefully. The naturalist was Daniel Carl Solander (1733–82), favourite pupil of Linnaeus and one of the several Swedes with whom Banks was associated. Solander had been working at the British Museum, to which he returned after the voyage, combining his duties there with those of librarian and assistant to Banks. The notebooks written during the voyage and the many manuscripts describing the animals and plants brought back, are now in the British Museum (Natural History). They testify to a methodical and accurate observer, a worthy disciple of the Linnaean method. The natural history assistant was another Swede, Herman Didrich Spöring, who was also a fair draughtsman and a useful hand at repairing instruments. One of the most important members of the team was the natural history artist, a young Quaker, Sydney Parkinson (c. 1745–71), who had already come to Banks' attention through his fine botanical drawings. Some 1,300 of Parkinson's drawings are now in the British Museum (Natural History); the majority of them are of botanical subjects, but 300 depict animals seen on the voyage. Parkinson worked under such pressure that most of the drawings are unfinished, details of colour often being merely noted on the back. In Tahiti, it is said, the flies were so numerous that they ate the colour off the paper as fast as the artist could lay it on! The man commissioned to portray landscapes and people was Alexander Buchan, a young man who was afflicted by epilepsy and who died on Tahiti, adding an even greater burden to the already overworked Parkinson. The party was completed by Banks' two servants, and also two negroes (both of whom succumbed to the cold during a night stranded on a mountain in Tierra del Fuego). This was Banks' team, and there is every evidence that they worked hard and well together.

Primitive state of botany and zoology

To fully appreciate the natural history aspects of the voyage one must remember



Sydney Parkinson, the young natural history artist on the voyage. About 1,300 of his drawings are in the British Museum (Natural History). [From an engraving in *A Journal of a Voyage to the South Seas in His Majesty's Ship the Endeavour*, transcribed from the papers of Sydney Parkinson, edited by his brother, Stanfield Parkinson, and published in 1773.]

the fairly primitive state of botany and zoology at this time. Studies such as the relationship of species to their environments, heredity, evolution, and biogeography were yet to expand into full branches of biology. What was still of overriding importance was a catalogue of nature's storehouse and a system into which the newly discovered material could be slotted.

The man who provided such a catalogue and system and who, at the same time, gave to botany and zoology their modern appearance, was the Swede Carl Linnaeus (1707–78). It is indeed remarkable that only a hundred years separate the 10th edition of Linnaeus' *Systema Naturae*—the starting point of modern zoological nomenclature—from the 1658 edition of Topsell's *History of Four-footed Beasts*, in which the unicorn, satyrs, and seven-headed hydra are solemnly described. Across the Channel, Buffon was toiling at volume after volume of his monumental *Histoire Naturelle*, wrapped in its gracious, flowery prose; but it was the simple nomenclature

and concise, even terse, descriptions of the *Systema Naturae* that provided the real key to the realms of nature. Armed with this one book, the explorer-naturalist could sail forth with confidence.

The voyage

The voyage to Tahiti was largely uneventful. The ship called briefly at Rio de Janeiro, where they were refused permission to land, and then safely rounded Cape Horn to arrive at Tahiti in good time to set up an observatory for the important observation of the transit of Venus on 3rd June, 1769. The observations were successful, and Cook set sail southwards to latitude 40° S. and then westwards to New Zealand. The stay on Tahiti had been pleasant, even idyllic, but Banks and his team worked hard collecting, describing, drawing, and preserving. As Sydney Parkinson's brother Stanfield later wrote, the crew indulged themselves in "sensual gratifications", but Sydney gratified "no other passion than that of a laudable curiosity protected by his own innocence". New Zealand, which Cook showed to be two main islands and not a promontory of the supposed southern continent, was less hospitable but provided plenty of interest for the naturalists.

From New Zealand they headed west again, and on 20th April, 1770, Lieutenant Hicks sighted the southeastern corner of Australia. Sailing northwards, they landed at Stingray Bay, renamed almost immediately Botany Bay, where Cook raised the flag.

They proceeded northwards again and entered the labyrinth of the Great Barrier Reef. On a night of bright moonlight, disaster struck. The keel rasped on coral and in a moment the ship stopped in its tracks, locked on the reef. For a time it was touch and go, but eventually the ship, stripped down to her lower masts and with all ballast thrown overboard, floated free, and Cook courageously chose to make land against the rising water in the holds. Beached at the mouth of the Endeavour River, the ship was repaired, and, not without at least one further near disaster, they slowly continued up the coast and through Torres Strait.

The bitterest blow, however, to the man who had not lost a single member of the

crew through scurvy, was yet to come. In Batavia, where they carried out extensive repairs to the ship, twenty-three men died from diseases (malaria and dysentery, chiefly), including Sydney Parkinson, Herman Spöring, and Green, the astronomer; Banks and Solander narrowly survived. Only this tempered the sense of triumph as *Endeavour* finally reached England almost 3 years after she set out.

Publication plans lapsed

For 3 years Banks and his companions had collected. As the material came in, it was described in the notebooks, listed, drawn, and preserved. Many hundreds of new plants, 500 fish, 500 birds, and hundreds of insects, shells, and other invertebrates were collected. The delight with which each new haul was made shines through the pages of Banks' journal. The *Systema Naturae* provided the framework, but it was a framework stretched to capacity with the quantities of new species crammed into every spare corner of the ship.

With the return of *Endeavour*, the scientific world eagerly awaited publication of the results. None was so impatient as Linnaeus, whose letters are filled with an agony of apprehension lest any disaster befall either the specimens or those destined to describe them. Banks and Solander were, of course, fully competent to describe the wealth of new forms. At first the attempt was made, but as the years went by the enterprise quietly lost momentum and eventually ground to a halt. The botanical results, brought almost to completion by 1784, were in the end never published. Fortunately, the plant specimens were kept intact and passed to the British Museum through the great botanist Robert Brown (Banks' third librarian) in 1827.

Banks, however, was chiefly interested in botany, and with the early death of Solander in 1782 the zoological results were left as a body of half-completed notes. Worse, the animal specimens were slowly given away, not only to the British Museum but to many private collections, so that with the passing of the years their connection with the Cook voyages was forgotten. The Leverian Museum received such material, later to be dispersed all over Europe when the museum was sold in 1806. William

Bullock's Museum, housed at the famous Egyptian Hall in Picadilly, also contained specimens from the Cook voyages, but these, too, were scattered when the museum was sold by auction in 1819. Another to receive material was John Hunter, the great surgeon-anatomist, and his collection passed to the Royal College of Surgeons. There were many others who benefited from Banks' great generosity. To find animal specimens from the Cook voyages nowadays, one must not only search in London, Liverpool, and Glasgow, but also in Leyden, Vienna, and Paris. No mammals, reptiles or amphibians survive; perhaps a hundred fish, twice that number of insects, some corals, a single crab, and a single tunicate. A shell collection from the Cook voyages, bearing labels by Solander, was found only comparatively recently in the British Museum (Natural History), where it had lain mislabelled for half a century. Linnaeus' worst fears had been realized—Solander was dead and the bulk of the animal specimens had become scattered and lost. The plants survived, but Banks' grandiose scheme to publish about them had come to naught.

"Captain Cook's Kangaroo"

What impact did the zoology and botany of this and the two succeeding voyages have on contemporary society? To Banks' credit, the breadfruit and other useful plants were exploited, but many of the animals were sufficiently close to known species as to arouse little popular interest. Dr Johnson had read that Britain supported 20,000 different insects; Banks and his friends would have done better to have stayed at home! There were other animals, however, that caught the public imagination, and none more so than what came to be known as Captain Cook's Kangaroo. Although marsupials had been seen as early as 1629 by Frans Pelsart, *Endeavour* brought back the first specimens of the larger kangaroos to be seen in Europe. At the Society of Artists' show in 1773, George Stubbs exhibited his famous painting of a kangaroo, based on one of the specimens from the *Endeavour* voyage. Unfortunately, none of these early kangaroo specimens now exist, the last relic, a skull in the Royal College of Surgeons, having been destroyed

during the air-raids of 1941. Among collectors of the day, it was the shells that had the greatest appeal, choice specimens changing hands at high prices. The public greatly admired the colourful birds, for many were on display at the Leverian and Bullock Museums. By the beginning of the nineteenth century, men such as George Shaw and, later, Edward Donovan, were producing serialized natural history tracts in which some of the species discovered on the Cook voyages were illustrated and described. It is of interest to note that even in the 1820's the association of a specimen or species with Captain Cook was still considered worthy of note.

The significance—and, in a sense, the justification—of the *Endeavour* and subsequent voyages to natural history lie in the quantity of material collected and the contribution that it made to knowledge of the diversity of animal and plant life. Although Solander's manuscripts were never published, nor even completed, his notes were used by later workers, in conjunction with the material and the drawings, to describe many new species. Often the novelty of the specimens brought back by Cook and Banks was somewhat blunted by the better preserved and more extensive collections of later travellers. The present bicentenary has in itself stimulated further research into such problems as the location of the animal specimens from the Cook voyages, some of it material on which new species were based and of the utmost importance to zoology. Two fitting tributes to the role of the naturalists on the Australian voyage have been produced by the British Museum (Natural History). The first is the publication of forty of Parkinson's fish drawings, reproduced with astounding realism by collotype, and the second is a book containing a hundred engravings of Parkinson's botanical drawings taken from the original copper plates that were to illustrate Banks' account of the botany of the voyage. Parkinson's craftsmanship cannot be praised too highly, but the drawings resulted from the work of a team led by Banks—and the team could not have made the contribution that it did to natural history without the genius of that great seaman, James Cook.

The "Endeavour's" Naturalists in Australia

By GILBERT P. WHITLEY
Honorary Associate, Australian Museum

The curiosities brought home by Mr. Bankes and Dr. Solander have already been seen by most of the Nobility, and we are assured several of the most extraordinary Phaenomena are to be taken in a few days to the Queen's Palace for the inspection of their Majesties . . . "Middlesex Journal", 31st August, 1771, quoted by J. C. Beaglehole in "The Journals of Captain James Cook on his Voyages of Discovery".

IN the eighteenth century young Englishmen of birth and wealth embarked upon the Grand Tour of Europe to broaden their minds by travel, enjoy scenery, visit cathedrals and art galleries, and engage in fashionable social rounds. But Joseph Banks (1743–1820), more interested in botany than in the fruits of a classical education, chose the Grandest Tour of all—a trip around the world from 1768 to 1771 with Lieutenant James Cook in H.M. Bark *Endeavour*.

Joseph Banks' right-hand man was Daniel Carl Solander (1733–1782), a Swedish naturalist who had been a pupil of Linnaeus. Although their assistants were required to take regular turns at watch, Banks and Solander were assigned no shipboard duties. On a typical day, they studied in Cook's great cabin from 8 a.m. to 2 p.m. "From 4 to 5 p.m., after the cabin had lost the odour of food, until dark, we sat at the great table with the draughtsmen directly across from us . . . while the plants were still fresh, we made rapid descriptions . . . and showed the draughtsmen how the drawings should be made."

The artists were very important members of an eighteenth century expedition—long before photography. They painted scenes, natives, their boats, weapons, and utensils, and they drew, from fresh specimens, plants and animals, many of which were used or eaten and not preserved. Hundreds of their paintings and sketches have fortunately survived.

Sydney Parkinson (1745–1771) was a Quaker, born in Edinburgh. The face and hands of his portrait have about them a sensitivity which is mirrored in the beautiful



The Swedish naturalist Daniel Carl Solander, Banks' right-hand man.

drawings and sketches (at least 1,300 in number) which he made for Banks on this voyage. But Batavia's unhealthy climate was to prove fatal to Parkinson and others and he died on the homeward voyage.

Herman Didrich Spöring (1735–1771), a versatile and "grave-thinking" man, was another to succumb after Batavia. He made beautiful drawings of sharks, rays, fish, and crabs. An account of Spöring has been given in this magazine by Z. Vrbicky and J. Kabat, June, 1964 (Vol. 14, No. 10), p. 322.

Though he was not an artist or a naturalist, mention should be made of John Gore (*circa* 1730–1790), a portrait of whom appeared in Beaglehole's *The Journals of Captain James Cook*, 3 (1), 1967, pl. 6B. Gore was born in Virginia, and was a war veteran who sailed four times round the world, the fourth being on Cook's last voyage. He shot the famous Kangaroo at Endeavour River and also collected a wallaroo, stingrays, and other animals.

First zoological notes

The first zoological notes from eastern Australia's coastline were made by Cook in his journal on 29th April, 1770, at what is now Botany Bay. I quote from the original "Corner" copy of the manuscript in the Mitchell Library, Sydney:

I landed in 2 places one of which the People had but just left as there were small fires and fresh Muscles boiling upon them, here likewise lay Vast heaps of the largest Oyster Shells I ever saw.

Further paragraphs in the manuscript are of the nature of a palimpsest, there are so many erasures and alterations. "In the evening," we read, "the Yawl return'd from fishing having caught 2 Sting rays weighing near 600 lb." Then Stingray Bay is altered to Bottny, later Bottony Bay, Bottonist Harbour, and Botany Bay, its accepted name.

The first published account of Cook's *Endeavour* voyage was the anonymous book "A Journal of a Voyage round the World, In his Majesty's Ship ENDEAVOUR . . . London, Printed for T. Becket and P. A. De Hondt, in the Strand. MDCCLXXI". It was not the author's "purpose to describe minutely those things which are more particularly the objects of Natural History, as Mr. Banks and Dr. Solander . . . will hereafter abundantly gratify the curiosity of those who delight in the study of nature". New South Wales is not named in this book (neither is Botany Bay), but we may quote, as the first printed account of their animals, the following:

The natives apparently subsist chiefly on fish, of which there is great plenty, especially of the sting ray-fish, weighing between two and three hundred pounds; and as they commonly swim in shallow water, they are easily taken: of these and other kinds we caught great quantities . . .

EXTRACTS FROM JOURNALS

Many of the extracts from Cook's and Banks' journals in this issue are from J. C. Beaglehole's editions of the journals—"The Journals of Captain James Cook on his Voyages of Discovery (Vol. 1, *The Voyage of the Endeavour, 1768–1771*)", published for the Hakluyt Society at the Cambridge University Press, and "The Endeavour Journal of Joseph Banks 1768–1771", published by the Trustees of the Public Library of New South Wales in association with Angus and Robertson.

We observed the dung of a quadruped, probably of the same species with those we afterwards killed at Endeavour River. Our greyhound likewise pursued a small animal, but staked himself in the chace without overtaking it. Crows and cockatoos we observed in great numbers; together with a very beautiful bird of the lory kind, which we called loryquet.

Snapper and tortoises (i.e., turtles) were noted from what is now Queensland. Although the unknown author of this *Journal* (a copy of which I have consulted in the Mitchell Library) may have laid himself open to grave charges of unauthorized publication, one wishes that his early account of our animals had been rather more detailed.

Pilgrimage

The next glimpse of our fauna was to be revealed in John Hawkesworth's *Account of the Voyages* (vol. 3, 1773, book 3, chapter 1), but this has been superseded by Beaglehole's masterly edition of Cook's journals, published 1955–1967. Details, therefore, need not be quoted here, though I should like to refer to some minor animals mentioned from Thirsty Sound, Queensland, where Cook and his men paid a short visit. When Beaglehole was preparing his classic redaction, it was still not known what species of insects, etc., were referred to by Cook's men from this still remote region. Accordingly, my late friend, the entomologist Anthony Musgrave, and I made a pilgrimage in May, 1957, to Thirsty Sound and its environs at the same time of the year as Cook's visit 187 years previously.

Banks' original journal in the Mitchell Library mentions, at Thirsty Sound, on 29th May, 1770:

. . . on the branches of [gum] trees & other trees were large ants nests made of Clay as big as a bushel . . . : the ants also were small and



Ants from the hollow stems of a tree of the same kind as Banks' "ant-tree", Thirsty Sound, Queensland. Four ants can be seen on a leaf in the top left corner and two on the central group of leaves. [Photo: A. Musgrave.]

had whitish abdomens: in another species of tree *Xanthoxiloides mite* a small sort of black ants had bored all the twigs and lived in quantities in the hollow part where the pith should be, the tree nevertheless flourishing, & bearing leaves & flowers upon those very branches as freely & well as upon others that were sound.

On our arrival at Thirsty Sound on 25th May, 1957, Musgrave and I immediately sought Banks' ant-tree and, just above the highest tidemark, there was a little bushy tree with fairly smooth grey bark, tangled branches, and flat green leaves with curled edges and brown dried tips. On breaking the tipmost twigs, we found they were hollow. Some of the dead-looking twigs supported green leaves; others showed fresh, light greenish-yellow wood when broken—and yes! there was the hollow brown core in which ants were present. They were sluggish, just crawling around their home, and had to be prised loose; they were rather elongate, brownish-black, with barrel-like abdomens and short legs, and their reddish-brown heads looked downwards. We were amazed that Banks should calmly

have observed such a minute feature as this when on a shore which, for all he knew, might have been infested with wild beasts or cannibals. Specimens of the ants and their home were brought to Sydney. The tree was identified as *Cupaniopsis anacardioides*. The ants belonged to three species of the genera *Colobopsis* and *Tetraoponera*.

Musgrave and I also examined a number of the "nests made of Clay as big as a bushel", the products of arboreal termites (*Microcerotermes turneri*). At the Endeavour River Banks was to see the pyramidal nests of other, terrestrial, termites which, he said, "very much resembled stones which I have seen in English Druidical monuments . . . ; Dr. Solander compared them to the Rune Stones on the Plains of Upsal in Sweden".

Kangaroo closely studied

Cook's enforced stay at Endeavour River offered excellent opportunities for collecting, and the kangaroo in particular was closely studied. So-called "Cockles" of enormous size must have been giant clams. Paper being in short supply, a copy of Milton's *Paradise Lost* was used to press plants. Banks was most active, climbing the mast-head to get a good view, or going out in a small boat, fishing or shooting or using his dipping net. He had with him a fine natural history library and many cases of bottles of several sizes, with ground stoppers, to preserve animals in spirits.

John Ellis, the Irishman who classified corals and zoophytes, wrote in a letter to Linnaeus in 1768 (quoted by James Wilson and Tony Randles in their book *The Endeavour*, published in Melbourne in 1968):

No people ever went to sea better fitted out for the service of natural history; they have all sorts of machines for catching and preserving insects; all kinds of nets, trawls, drags and hooks for coral fishing. They have even a curious contrivance of a telescope, by which, put into the water, you can see the bottom at great depth, when it is clear

But what happened to all the specimens, the journals, and drawings from the first and later Cook voyages? Most of them piled up in Sir Joseph Banks' house in London. Although many manuscripts and illustrations went to the British Museum, where they could be examined by scholars,

"Under the lee of this point Lieutenant James Cook R.N. landed on 24th May 1770" reads the inscription on this memorial at Seventeen Seventy (the appropriate name of the district), Bustard Bay, Queensland, where Cook made his first landing after leaving Botany Bay. [Photo: Author.]



a great deal of material remains unpublished to this day. Banks and Solander refused to join Cook's second voyage, because of unsuitable accommodation, and both went on to other interests. The worried Linnaeus was already doomed to disappointment when he wrote a letter in October, 1771, to John Ellis:

All sublunary things are uncertain, nor aught anything to be trusted to treacherous futurity. I therefore once more beg, nay I earnestly beseech you, to urge the publication of these new discoveries. I confess it to be my most ardent wish to see this done before I die. To whom can I urge my anxious wishes but to you, who are so devoted to me and to science?

Remember me to the immortal Banks and Solander.

Specimens from Cook's naturalists went to the Linnean Society, the British Museum, the Royal College of Surgeons, and various private museums in Britain. When the latter were disbanded and their contents were sold, Continental museums acquired specimens, and some still exist in Russia, the United States, and other lands. A fine series of Cook relics, drawings, and specimens were obtained for the Australian Museum, of which the *Encyclopaedia of New South Wales* (1907) remarked, "The most interesting exhibits now in the institution are the relics of Captain Cook, and where they are grouped is the 'Nelson's Corner' of the Museum". Most of this collection was transferred in 1955 to the Mitchell Library,

including the "Corner" copy of Cook's Journal. In 1932, Miss Sylvia Corner, of Whitby, England, specially visited the Australian Museum to see this priceless manuscript, of which her grandfather had been the owner.

The centenary of Cook's discovery of New South Wales was hardly celebrated in this State; not until several years later was the statue of him erected in Hyde Park near the Australian Museum. The bicentenary, however, is to be royally honoured. A most fitting memorial to Cook's naturalists would be to disinter their works from their present obscurity and proclaim them to the world.

FURTHER READING

- Beaglehole, J. C., 1955-1967: *The Journals of Captain James Cook on his Voyages of Discovery*. (Cambridge: University Press and Hakluyt Society), 3 vols in 4 and portfolio.
- Beaglehole, J. C., 1962: *The Endeavour Journal of Joseph Banks 1768-1771*. (Sydney: Public Library and Angus and Robertson), 2 vols.
- Iredale, T., 1924: "Museums of the Past". *Australian Museum Magazine*, vol. 2, p. 88.
- Reed, A. W. (editor), 1969: *Captain Cook in Australia*. (Wellington: A. H. and A. W. Reed.)
- Rienits, Rex and Thea, 1968: *The Voyages of Captain Cook*. (London: Hamlyn.)
- Whitehead P. J. P., 1968: *Forty drawings of fishes made by the artists who accompanied Captain James Cook . . .* [London: British Museum (Natural History)].

THE FIRST BOTANICAL STUDIES IN AUSTRALIA

By D. J. MCGILLIVRAY

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*The great quantity of plants Mr. Banks and Dr. Solander found in this place occasioned my giving it the name of Botany Bay.—
Cook's Journal.*

JOSEPH BANKS, an influential adventurous young man, had joined the *Endeavour* voyage to the South Seas on the recommendation of the Royal Society, of which he was a Fellow. His retinue comprised Daniel Solander, who had eagerly volunteered to come as a companion and scientific adviser, two draughtsmen, Sydney Parkinson and Alexander Buchan, a secretary, Herman Spöring, and four servants.

In his youth Banks had developed a keen interest in natural history, particularly botany, and he had commenced a natural history collection, together with a library, for which he was to be renowned. Banks was elected to the Royal Society in 1766 while on a voyage to North America, and on his return he attended the Society's meetings, extending his acquaintanceships, rather than his knowledge, in the sphere of natural philosophy.

Daniel Solander had come to England in 1760 on the recommendation of Linnaeus. He was industrious and of pleasant disposition, attributes which soon earned him the respect and affectionate regard of his friends and scientific fellows. As a result of the *Endeavour* voyage his name became closely linked with that of Banks, whose social eminence overshadowed Solander's great scientific ability.

Sydney Parkinson was a young Scot who, though apprenticed to a trade, had followed his natural interest and abilities in the painting of plants and animals.

How Banks and Solander worked

The *Endeavour* sailed from Plymouth in August, 1768, and came within sight of the Australian coast on 19th April, 1770. In



Joseph Banks, from the painting by Sir Joshua Reynolds. [Photo by courtesy of the Director, Royal Botanic Gardens, Kew, England.]

20 months the vessel had visited Madeira, Rio de Janeiro, Tierra del Fuego, and Tahiti, and circumnavigated New Zealand. Already many hundreds of species had been collected, described, and illustrated. The gathering of specimens was usually done jointly by Banks and Solander, with Banks supervising their drying and storage, while Solander maintained the catalogues and prepared his manuscript descriptions. In the following passage Banks describes the daily routine. His participation in the descriptive work was probably less than this account indicates.

In the careening a large number of plant specimens, which Banks had carefully stored in a bread compartment in the after end of the ship, became submerged in sea-water (still held in the bilge) as the bow was lifted on to the shore. Many of the specimens were spoiled and had to be discarded. Some reparation for this loss came from the comprehensive collections made during the 6 weeks' stay enforced by their misadventure. More than 200 species were obtained, of which about 190 were illustrated. Here in the tropics the season was more favourable for finding plants in flower than it had been at Botany Bay.



Myrmecodia beccarii. From a drawing by Sydney Parkinson, completed by J. F. Miller. [Photo by courtesy of the British Museum (Natural History).]

The laborious procedure by which the large quantity of plant material was dried is explained in this extract from Banks' journal:

Our plants dry better in Paper Books than in Sand, with this precaution, that one person is intirely employd in attending them who shifts

them all once a day, exposes the Quires in which they are to the greatest heat of the sun and at night covers them most carefully up from any damps, always carefull not to bring them out too soon in a morning or leave them out too late in the evening.

Solander worked diligently on his descriptions of the many new plants collected in the Endeavour River area, and added 313 pages to his manuscript florula. One of these pages, reproduced in this article, carries a description of the plant now known as *Myrmecodia beccarii*, with a reference to an earlier page in the manuscript, together with a description of *Banksia dentata*, later to be described by the younger Linnaeus. Solander's comment that this species was rare at Botany (Sting-Rays) Bay relates to another species, *B. robur*, which does not occur as far north. The original descriptions of fifty species are based on specimens collected by Banks and Solander at Endeavour River.

After temporary repairs were completed they sailed early in August. Further collections were made during brief visits to Lookout Point, Lizard Island, Possession Island, and Booby Island.

Later botanical work on the voyage was of little consequence. There were many deaths from the dysentery and malaria contracted in Batavia, and those who survived were anxious to return to England. From Banks' original party only four returned—Banks himself, Solander, and two servants. Two of the servants had perished in the freezing conditions at Tierra del Fuego, Buchan had died in a fit of epilepsy at Tahiti, and Parkinson and Spöring had succumbed to the fever.

Later voyage

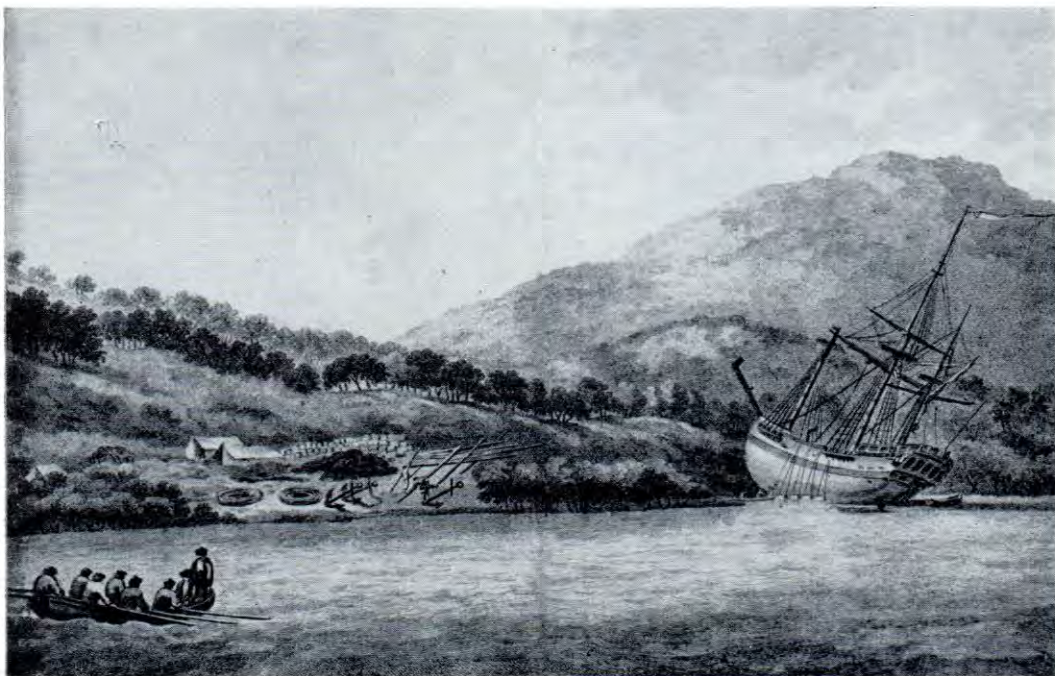
Within 12 months of their return Banks and Solander were preparing for another voyage, again with James Cook, this time on H.M.S. *Resolution*. Linnaeus was grieved to hear of these plans, as he was anxious to see the publication of Solander's work, in which so many new species were to be described. Differences of opinion between Banks and the Admiralty resulted in Cook being accompanied by the naturalists J. R. Forster and his son George, and Banks and Solander voyaging to Iceland. On their return, work continued on the *Endeavour*

manuscripts and illustrations, but other tasks associated with Banks' library and herbarium in Soho Square and with the Royal Gardens at Kew took much of their attention. Solander died in May, 1782, and Banks could not maintain the zeal that was necessary for the work to be completed. Although the conscientious efforts of Solander and Parkinson and the youthful enterprise of Banks did not culminate in the magnificent publications envisaged, they provided a firm basis for the further study of Australian botany.

FURTHER READING

- Beaglehole, J. C. (ed.): *The Endeavour Journal of Joseph Banks, 1768-1771*. The Trustees of the Public Library of New South Wales. 2 vols. 1962.
- Cameron, H. C.: *Sir Joseph Banks*. Angus and Robertson, 1952.
- Rauschenberg, R. A.: *Daniel Carl Solander, Naturalist on the Endeavour*. Transactions of the American Philosophical Society, new series, volume 58, part 8. November, 1968.
- Rienits, R. and T.: *The Voyages of Captain Cook*. Paul Hamlyn, 1968.
- Stearn, W. T.: "The botanical results of the *Endeavour* voyage". *Endeavour*, volume 27, number 100, pages 3-10, January, 1968.

The "Endeavour" Ashore for Repair



The *Endeavour* undergoing repair at the mouth of the Endeavour River after running aground on the Great Barrier Reef. [From an engraving in John Hawkesworth's account of Captain Cook's voyage to Australia, which was prepared from Cook's journal and Banks' papers and published in London in 1773.]

CAPTAIN COOK AND THE AUSTRALIAN ABORIGINE

By J. V. S. MEGAW

Senior Lecturer in Archaeology, University of Sydney

... we set out from the ship intending to land . . . as soon as we aproachd the rocks two of the men came down upon them, each armd with a lance of about 10 feet long . . . They calld to us very loud in a harsh sounding Language . . . shaking their lances and menacing, in all appearance resolvd to dispute our landing to the utmost . . . From the description of the landing at Botany Bay in Banks' journal.

↓ September, 1771, James Cook wrote a letter from London to his fellow Berkshireman, Captain John Walker, of Whitby, under whom, from the age of 19, he had served in the coaling trade. Cook's opinion of the Australian Aborigines was that ". . . they appear to some to be most wretched upon Earth; but in reality they are far more happier than . . . we Europeans being wholly unaquainted not only with the superfluous but (also) of the necessary Conveniences so much sought after in Europe they are happy in not knowing the use of them". This, in contrast to the low opinion of the northern Aborigine held by seventeenth-century white discoverers, such as the Dutchman Jan Carstenz and the English buccaneer William Dampier, was the verdict of a man whom Dr Samuel Johnson's friend the diarist Fanny Burney described as "the most moderate, humane, and gentle circumnavigator that ever went out upon discoveries".

Captain Cook's "humanity" and his keen observation, which led him to comment in detail on the manners and customs of almost every new people he met on his voyages, were without doubt contributing factors in making the Southern Hemisphere a significant influence on the developing taste and traditions of the romantic era. It was, however, the islands of the Pacific rather than Australia itself which matched up to the newfangled philosophy of Jean-Jacques Rousseau directing, too late, the pampered pre-Revolution rich of France



Plate 1: The landing at Botany Bay. From the drawing by Thomas Stothard in the Mitchell Library, Sydney.

back to nature. Such unwilling settlers at Port Jackson as Captain James Campbell, Captain of Marines on Governor Arthur Phillip's ship the *Sirius*, were completely disenchanted with the realities of native life as they saw it, bereft of any artistic or literary ennobling of seemingly over-savage features. Echoing Dampier, Captain Campbell wrote to a friend in England that "the more we see of (the natives), the more we are convinced of their being the most abject of the human race yet met with—they, however, do not seem so very devoid of curiosity, as Captain Cook has represented them to be . . ." Small wonder that the frontispiece for Andrew Kippis' account of Cook's voyages (Kippis, author

of the first biography of Cook, which appeared in 1788, the year of the First Fleet's arrival in Botany Bay) should be based on a drawing by Thomas Stothard (1755–1834) in which a completely imaginary impression of Cook's landing at Kurnell shows the defending natives looking for all the world like Maori chieftains (pl. 1).

Cook's first sighting of Aborigines

If prejudice and preconditioning should have resulted in so distorted an image of the Australian Aborigine, what of Cook's own more detailed remarks on the natives of the east coast and what, if any, material evidence is there for the actual brief encounter between British and native during Cook's 5-month voyage in east Australian waters? Cook's first sighting of natives was a week before the landing in Botany

Bay, on 22nd April, 1770, when a group of Aborigines were seen on the shore near Brush Island, north of Bateman's Bay. On 28th April, when still 2 miles from shore, Cook, Sir Joseph Banks, the Swedish botanist Solander, and Tupaia the Tahitian put out in a yawl and observed three or four canoes pulled up at what would have been the south entrance to Botany Bay—first named by Cook "Sting-Rays Harbour".

Then, on the afternoon of Sunday, 29th April, Cook recorded in his journal how he "saw as we came in on both points of the bay several of the natives and a few huts, Men, women, and children on the south shore abreast of the ship". The *Endeavour* anchored, and a boat put out for the shore. Two natives only remained to oppose the landing with spears and shields—the only place Cook was to observe a native shield.



Plate 2: Aboriginal artefacts, from a book of drawings by Sydney Parkinson. [Photo by courtesy of the Trustees of the British Museum.]

Once landed, the party went up to "a few small huts made of the bark of trees in one of which were four or five small children with whom we left some strings of beads & c^a. A quantity of darts lay about the huts these we took away with us. Three canoes lay upon the beach the worst I think I ever saw, they were about 12 or 14 feet long made of one piece of the bark of a tree drawn or tied up at each end and the middle kept open by means of pieces of sticks by way of thwarts".

The "huts", spears, boats from which the natives were frequently observed to fish, and shields in the form of "a Target made from the bark of the gum tree", to quote from Cook's further detailed observations on Aboriginal material culture, are all represented in what seems to be the only extant sketch of Aboriginal artefacts made on Cook's first voyage (pl. 2). The picture is preserved in a book of drawings in the British Museum ascribed to Alexander Buchan, which, though unsigned, must in fact be by Sydney Parkinson who, after the death on Tahiti of Buchan, the expedition's epileptic topographical artist, had to take over subjects other than the botanical and zoological studies for which he had been originally employed by Banks. Also to be seen in the sketch is a spear-thrower as described by Cook, here apparently tipped at the reverse end with a stone adze-flake.

Collecting of spears

Banks himself mentions the collecting of spears on the first day at Botany Bay. His diary notes no less than forty or fifty "of various leng(t)hs, from 15 to 6 feet in leng(t)h; all we found except one had 4 prongs headed with very sharp fish bones which were besmeared with a greenish coloured gum" which Banks at first believed was poisoned. Of these forty or fifty spears four, given by Banks to his friend, John Montague, fourth Earl of Sandwich, are now in the collections of the University Museum of Archaeology and Ethnology at Cambridge (pl. 3). Only one in fact has four prongs, the tips being pointed slivers of fish or mammal bone mounted in gum

and bound with vegetable fibre. The bone points of these "fish gigs" or fishing spears, either pointed at one or both ends, have been recently noticed to be a common feature of Aboriginal coastal sites in south-east Australia, while both multi-pronged and simple fire-hardened wood-tipped spears—also represented in the Cambridge collections—are illustrated in watercolours and described in the early accounts compiled after the establishment of the first permanent white settlement at Port Jackson.

Other Aboriginal objects which can be associated with Cook are at present few in number; the Australian Museum has a knobbed club and a boomerang-shaped object, both recorded as "Cook collection" without further details. The "boomerang" is something like the wooden swords of the rainforest people of northern Queensland, but it is more likely to be a throwing stick such as was noted by Cook while at Botany Bay (pl. 5). Cook also observed in his diary for 1st May the actual cutting down of trees and stripping of bark for shields; in the British Museum there is a bark shield with hand-grip precisely as illustrated in the "Buchan" sketch (pl. 2). The British Museum shield again lacks full documentation, but it is marked "Captain Cook Acc." and has been in the Museum's collection for at least a century.

These, then, are all the museum objects which can at the moment be associated more or less directly with Cook's visit to Australia. During the enforced stay at the Endeavour River following the grounding on the Barrier Reef on 11th June, 1770, Cook encountered the natives on several occasions. They retaliated by casting spears or attempting to drive the expedition off the shore by firing the scrub, but they became peaceable enough for one of

Plate 3: *Below:* The head of one of the Aboriginal wooden fishing spears which Banks brought back to England from Botany Bay. The prongs are about 50 centimetres (about 20 inches) long. *Right:* Detail of one of the bone barbs. [Photos by courtesy of the University Museum of Archaeology and Ethnology, Cambridge.]





Plate 4: The Captain Cook Landing Place Reserve, Kurnell, Botany Bay, showing the 1968 archaeological excavations. The approximate position of the *Endeavour's* anchorage was on the extreme left. [Photo: Author.]

them to exchange his headband of human hair for a strip torn from one of Cook's discarded shirts. There is, however, no record of any further collections of ethnographic specimens from Queensland, nor is there any reason to associate any of the objects just described with that area.

The Aborigines whom Cook met at Botany Bay were by no means the first in the district; indeed, recent excavation has pushed back prehistoric settlement in the south Sydney area to some 7,500 years ago. Shortly after arrival, Cook caused pits to be dug in the sand in search of a good water supply, and Richard Pickersgill, master's mate on the *Endeavour*, notes in

his diary for 5th May, 1770: "Upon digging we found vast quantities of oyster-shell which seems to have been underground a great while". In January, 1968, although the present pleasant lawns, neatly planted trees, and noble monuments of the Captain Cook Landing Place Reserve at Kurnell can have little resemblance to the sandy foreshore backed by well-stacked woods described in the various early journals, the Sydney University Archaeological Society, with the financial assistance of the Australian Institute of Aboriginal Studies, started the first of a series of excavations in an attempt to locate what, if any, signs of Aboriginal occupation still survived (pl. 4).

Plate 5: A boomerang-shaped artefact, probably a throwing stick, and a club, from the Australian Museum's Cook Collection. The club is 80 centimetres (about 32 inches) long. [Photo: C. V. Turner.]



The area selected was close to the now dammed-up "watering place" shown near Cape Sutherland on "A Sketch of Botany Bay in New South Wales", one of Cook's maps now in the British Museum. A small reproduction of this map is on the front cover, but the word "freshwater" on it is so small as to be barely legible. Extensive probing along the foreshore area between the "watering place" and the Captain Cook Landing Place Trust's landing stage revealed upwards of 2 metres of tightly packed shell midden preserved under the modern turf. Two areas were opened up in the vicinity of the Postmaster-General's Department's inspection vaults, during the construction of which two adult skeletons had been recovered from the midden. The excavation of the midden produced finds typical of the specialized type of foreshore site of the east coast, revealing exploitation of strictly local resources—fish, seal, marine birds, and shellfish—together with the specialized tool kit needed for their catching and gathering. As the 1770 accounts noted, the Mud Oyster (*Ostrea sinuata*) was present in considerable numbers, although it is by now extinct in Botany Bay; the Common Mussel (*Mytilus planulatus*) was the other main species in the midden. Here was evidence of "the small fires and fresh mussels broiling upon them" and "the vast heaps of the largest oyster shells" Cook had ever seen.

"Working tools"

Of the actual artefacts recovered from the excavations, the "working tools of stone, bone and shell" observed by Cook were all present. They ranged from bone points (pl. 6) (including one with traces of gum still adhering) which were just like those used for tipping the spears in the Cambridge collections (pl. 3), to the flat pear-shaped stone "fish-hook files" used in the production of the crescentic shell fish-hooks found elsewhere at Kurnell and described and illustrated from the time of the First Fleeters on.

Interesting finds

Cook, writing on 1st May after the burial of the seaman Forby Sutherland near the cape which was subsequently given his name, mentions a visit to "hutts not far from the watering place where some of the



Plate 6: An iron nail (left), two bone spear points (top right), and a bone button mould (left centre) from the 1968 excavations at the Captain Cook Landing Place Reserve. At right centre is a blue glass bead found in a rock shelter at Curracurrang Cove, Royal National Park, about 15 kilometres (10 miles) south of Kurnell, and at bottom is a bone button mould found beneath the floorboards of a house at Cirencester, Gloucestershire, England. [Photos: University of Sydney.]

natives are daily seen, here we left several articles such as cloth looking glasses combs, beads Nails &c^a.". No less interesting than the Aboriginal finds from the Kurnell excavations has been the discovery in the midden of a square-section hand-made nail (pl. 6), a fragment of a cylindrical wine or rum bottle of a type common in the late eighteenth or early nineteenth centuries, and a bone button mould. This last probably formed the base of a cloth or embroidered silk-covered button as worn on men's coats and waistcoats towards the

end of the eighteenth century—just like the dress buttons on Cook's naval uniform in Dance's famous portrait in the National Maritime Museum, Greenwich. Such bone buttons were produced as a local cottage industry in the west of England, and several very similar bone moulds, probably the contents of a work-box, were found beneath the floorboards of a house at Cirencester in Gloucestershire together with a group of late eighteenth-century metal buttons and a number of coins all dated to before 1815 (pl. 6).

Although no "beeds" have yet been found in the Kurnell midden, one, a small biconically perforated blue glass bead, has been found in the upper level of a large rock shelter at Curracurrang Cove, some 10 miles south of Kurnell (pl. 6) and within the same ancient tribal area.

One cannot be certain that this European material is necessarily to be associated with the events of April and May, 1770, though the memory of Cook was allegedly still alive in the time of the last Aboriginal chief of the Kurnell area, who died around 1850. Members of the First Fleet, such as Marine Captain Watkin Tench, also record the giving of gifts, including nails, to the natives in January, 1788. There is, however, a fair chance that when the second

series of excavations takes place at Kurnell in 1970, there may well be further evidence of the material impact on Australia of the man who, in his own words, could "hardly admit of an excuse for . . . leaving a Coast unexplored he has once discover'd".

FURTHER READING

The best source on the subject of Cook and the Aborigines is, of course, Cook himself, who is quoted here from *The Journals of Captain James Cook on his Voyages of Discovery. I, The Voyage of the Endeavour, 1768-1771* (ed. J. C. Beaglehole), published for the Hakluyt Society at the Cambridge University Press, 1955. The impact of Australia and the Pacific on European thought and ideas, especially in art, is thoroughly examined by Bernard Smith in *European Vision and the South Pacific 1768-1850* (Oxford, 1960), while the combination of historical, archaeological, and artistic evidence for reconstructing the last stages of Aboriginal settlement in the Sydney area has been surveyed by J. V. S. Megaw in "Art, Archaeology and Aborigines," *Journal of the Royal Australian Historical Society*, 53 (1967), 277-94. Amongst the many illustrated introductions to Cook's life and voyages, the most recent and one of the best illustrated is Rex and Thea Rienits' *The Voyages of Captain Cook* (London, 1968); also well illustrated is Oliver Warner's *Captain Cook and the South Pacific* (London, 1964). A new survey of the whole range of Aboriginal archaeology, one of whose most valuable contributions is its treatment of the impact of the outside world on the Australian Aborigine, is D. J. Mulvaney's *Prehistory of Australia* (London, 1969), especially chapters 1 and 3.

BOOK REVIEWS

OCEANIC ART, MASKS AND SCULPTURES FROM NEW GUINEA, by Jean Guiart. Collins in association with UNESCO. Price, 90c.

Despite its title, this little book is exclusively about the art of the Sepik River area. It consists of a 20-page introduction by Professor Guiart, of the University of Paris, who has worked with Oceanic art for many years, and 32 colour plates.

Guiart is concerned primarily to explore how little we know of the context, meaning, and often provenance of the thousands of Sepik carvings now scattered through the world's museums, and also to discuss the reasons why the Sepik became one of the world's greatest primitive art centres. There are also brief accounts of the various "style areas" within the province of Sepik art. This introduction is one of the most perceptive brief accounts available, although readers unacquainted with the field will find it heavy going in places.

The plates bear little direct relation to the text and are not referred to in it. In their own right, however, they provide a good conspectus of Sepik styles, and the quality of the photography and

colour printing is superb for such a small book.—*J. Peter White.*

A PORTFOLIO OF AUSTRALIAN BIRDS, by William T. Cooper. Text by Keith Hindwood. A. H. and A. W. Reed, Sydney, Wellington, Auckland, 1968. 60 pages. Price, \$9.95.

Not for many years, in fact not since Neville W. Cayley, has Australia had an artist capable of painting the country's flora and fauna accurately. This book shows that we at last have such a person. The artist is a naturalist, and it is clear that he has observed all the birds alive. In some cases there is too much blue, as in the case of the male Red-tailed Black Cockatoo, but this is the fault of the printers and not of the artist.

Mr Hindwood has, as usual, produced a most interesting text. The information on the history, habits, behaviour, and world position of the group is not to be found readily elsewhere.

The book is recommended, for both the pictures and text, to all interested in Australia.—*H. J. de S. Disney.*



Some of the eleven steep-sided mountains known as the Glass Houses, about 45 miles north of Brisbane. Cook saw three of these remarkable mountains, and named them the Glass Houses because they reminded him of the glass furnaces of Yorkshire. [Photo by courtesy of the *Courier-Mail*, Brisbane.]

Captain Cook's Australian Landmarks

By R. O. CHALMERS

Curator of Minerals and Rocks, Australian Museum

In the Course of this Journal I have at different times made mention of the appearance or Aspect of the face of the Country, the nature of the Soil, its produce &c.—Cook's journal.

CAPT. Cook's historical first voyage of 1770 along the east coast of Australia still occupies the attention of scientists and historians alike.

It must be a great experience to be the first to name prominent landmarks when charting a hitherto unknown coastline. Physiographic features inherit their special characteristics in part from their geological structure, so that geologists are specially interested in many of the names given by the great explorer to striking coastal cliffs, promontories, and impressive high peaks.

The coastline was first sighted at daybreak

on 20th April by Lt Zachary Hicks. Cook named the granite promontory Point Hicks. It is now known as Cape Everard, and is in Victoria. A little further on he named a headland the Ramhead because it reminded him of a round hillock of the same name at the entrance to Plymouth Sound.

Igneous intrusives

A day or so later, when sailing along the far south coast of New South Wales, Cook recorded "a pretty high mountain laying near the shore which on account of its figure I have named Mount

Dromedary". This lies near Tilba Tilba and consists of a complex of coarse-grained igneous rocks, monzonitic in type. These have intruded metamorphosed sediments, and subsequent uplift and differential erosion have caused the more resistant monzonite to stand out as a prominent mountain. A number of Cook's landmarks are igneous intrusives. It should be understood that these are squeezed up into zones at varying distances from the earth's surface. In most cases the sedimentary rocks into which these igneous masses are intruded are more easily weathered, and the forces of erosion, throughout the vast expanses of geological time that elapse after their formation and solidification, wear away the less resistant sedimentary rocks, leaving the igneous masses standing out as prominent mountains.

Further north, on much of the coastal and inland area between Bateman's Bay and Nowra, there is an extensive development of gently tilted sedimentary beds laid down under marine conditions in Upper Permian time, about 250 million years ago. This

whole sedimentary sequence is designated the Shoalhaven Group, and was formerly known as the Upper Marine Series.

The oldest member is the Conjola Formation, comprising mainly conglomerates and sandstones. Cook wrote in his diary: "On April 22nd we were abreast of a point of land which on account of its perpendicular cliffs I called Point Upright". These are cliffs of one of the resistant members of the Conjola Formation. Point Upright is the northern headland of the entrance to Durras Lakes.

Pigeon House

Further north, Cook named a "remarkable peak'd hill lying inland, the top of which looked like a Pigeon House". Cook may have had some nostalgic flashback to his teenage period when he worked on the Yorkshire farm of which his father was bailiff. He must have seen many pigeon lofts.

Pigeon House, which is in the Budawang Range to the west of Ulladulla, owes its remarkable shape to the fact that a small



Pigeon House, a mountain in the Budawang Range to the west of Ulladulla, New South Wales. Cook gave it this name because he thought that its top looked like a pigeon house or loft. [Photo: Keith Hindwood.]

residual of a massive cliff-forming coarse quartz sandstone, known as the Nowra Sandstone (formerly known as the Nowra Grit), is perched on the Wandrawandian Siltstone, a clayey sandstone which is less resistant to weathering and forms smooth, steep, thickly vegetated slopes. These two formations overlie the Conjola Formation and are also part of the Shoalhaven Group.

Between Nowra and Wollongong the predominant geological feature in the Permian is the widespread development of basaltic-type rocks known as latite because they are rich in oxides of sodium and potassium. These originated as submarine flows that penetrated the Permian sediments while they were unconsolidated.

The largest and most extensive of these is the Dapto-Saddleback Flow that outcrops extensively at Red Point, Port Kembla, and constitutes four of the Five Islands which lie offshore. Cook named it Red Point "because some part of the land around it appeared of that colour". It is a fact that the soil in the area is red, due to the iron oxide formed during the weathering of the latite.

"White cliffs"

The next geological observation made by Cook was along the coastline immediately to the north of Garie Beach. Cook wrote, "There are some white cliffs which rise perpendicular from the sea to a moderate height". This is the most southerly point where the resistant, massive Hawkesbury Sandstone of middle Triassic Age forms the coastline. All the sedimentary formations of the Sydney Basin, ranging in age from Permian to Triassic, dip gently towards the north. As one travels north the formations on the coastline become successively younger. Whereas the Hawkesbury Sandstone outcrops at the top of the coastal scarp at Bulli, Coalcliff, and Stanwell Park, due to the prevailing gentle northerly dip it is on the coastline all the way from Garie Beach to Dee Why and forms the vertical rugged cliffs that make the Sydney coastline one of the most impressive in the world. Cook's "white cliffs" are accurately pinpointed as being immediately to the north of Garie, because he gives the exact latitude. For an account of the succession of Permian and Triassic

formations on the South Coast see G. Rose's article "Triassic Rocks of the Sydney District" in *Australian Natural History*, vol. 15, no. 1, 1965.

Cook's next entry in his diary emphasizes a misfortune that frequently befell sailing ships, namely, that of being blown back along their tracks. He writes, "during 27th and 28th April we lost ground owing a good deal to the variableness of the wind". The *Endeavour* was blown back to the latitude of Bulli. Here Cook, Banks, and Solander tried to get ashore in the yawl, but were prevented from landing by the heavy surf. They had sighted Aborigines on the beach, so they took Tupaia with them. Tupaia had willingly accompanied Cook from Tahiti to act as an interpreter. He was of great assistance in conversation with the Maoris, his Polynesian kinsmen, during the circumnavigation of New Zealand in the 6 months prior to Cook's arrival at the eastern coast of Australia. Understandably, since Australian Aborigines are quite a unique people entirely unrelated to Polynesians, when the expedition had a face-to-face encounter with them in Botany Bay and, later, on the Endeavour River, Tupaia could not understand their language.

Botany Bay observations

Then the historic entry into Botany Bay was made. It seems clear that this name was not given until Banks realized, some considerable time after the expedition left the bay, what a wealth of botanical specimens he had collected. The original name was Sting Rays Harbour, no doubt because, with grateful thanksgiving, this little band of men supplemented their salt pork diet with catches of stingrays weighing in all about half a ton.

Of the many observations made by Cook during his stay in Botany Bay from 29th April to 5th May, one is of particular interest to geologists. On 3rd May Cook, Solander, and Monkhouse had a day out in the yawl. They landed at a spot where Cook in his diary recorded a rocky outcrop "which was almost to the head of the inlet". He stated that "the stone is sandy and very proper for building etc." The remark is quite prophetic because this rock was, of course, the Hawkesbury Sandstone which outcrops extensively in the Sydney district



Mount Warning, New South Wales, so named by Cook because, soon after he sighted it, the *Endeavour* encountered dangerous shoals. [Photo: P. J. Solomon.]

and came to be quarried extensively to build nearly all of Sydney's early buildings, including the Australian Museum, the University of Sydney, Government and civic buildings, cathedrals, and many churches.

The actual landing place at "the head of the inlet" could have been one of four—Rocky Point (Sans Souci), Taren Point, Tom Ugly's Point, or Sylvania. C. H. Bertie ("Captain Cook and Botany Bay", *Journal of the Proceedings of the Royal Australian Historical Society*, X, 5, 1924, 233-278), thought the most likely place was Rocky Point, but admits this conclusion to be based largely on conjecture.

Cook makes another important mention of what we now call George's River. He wrote, "In the morning I had sent Mr. Gore with a boat to the head of the bay to drudge for oysters". It is an intriguing thought to envisage Cook, Banks, and Solander, as a prelude to their dinner, washing down the now famous succulent Sydney oyster with a draught of good white.

The Three Brothers

Between Taree and Port Macquarie the little town of Laurieton (Camden Haven) lies at the foot of a 1,600-foot-high mountain, the North Brother. Close by to the south are the Middle or West Brother (1,800 feet)

and the South Brother (1,600 feet). Cook described them as "three remarkable high hills lying contiguous to each other, not far from the shore. As these hills bore some resemblance to each other we called them the Three Brothers". These together make up a single huge horizontal sheet-like mass of igneous rock of a type known as trachyte. The great mass was intruded from depths in the earth's crust in a hot, viscous condition. In the vicinity of the vents that acted as feeders, the molten trachyte domed up into three humps that now stand out as the three rounded mountains.

One of the most spectacular geological features in the whole of Australia was noted by Cook. The "remarkable sharp peak'd mountain" that Cook named Mount Warning is 3,700 feet high and marks the site of the central vent from which vast quantities of lava of different types were erupted in early Miocene time. A number of plutonic igneous rock types more or less arranged in zones and consisting of gabbro, diorite, syenite, and granophyre make up the central bulk of Mount Warning. A great sunken erosion caldera 14 miles in diameter and only 400 feet above sea-level surrounds the mountain. The caldera is truncated by the coastline, but elsewhere

VIEW of the PIGEON HOUSE and Land adjacent



A VIEW of CAPE BYRON and MOUNT WARNING



Cook's sketches of some of eastern Australia's coastal landmarks.

A VIEW of PENTECOST ISLAND at the Southern entrance of WHITSUNDAYS PASSAGE



is surrounded by a high rim of steep, almost vertical, cliffs made up of flows of acid crystalline and glassy rocks such as rhyolite, obsidian, and perlite. The simple but effective sketch that Cook drew in his diary shows all these features in addition to the mountain itself. The flows of acid rocks are intercalated in the oldest and most widespread member of this whole vast volcanic sequence, a thick series of basalt flows known as the Lismore Basalt. These basalt flows are very extensive and form the periphery of the Tweed Shield Volcano, the name applied to the whole area of volcanic rocks covering 1,500 square miles in New South Wales and Queensland. They outcrop at many places on the coast, including another of Cook's landmarks, Point Danger, on the New South Wales-Queensland border.

Mount Warning and Point Danger were so named by Cook because, shortly after sighting them, the *Endeavour* encountered dangerous shoals off Morton (Moreton) Bay, another of his place names. Cook named this great bay after the Earl of Morton, so the accepted present-day spelling is incorrect.

The Glass Houses

Cook had another reminder of his home country about 45 miles north of the site where Brisbane now stands. Here there are eleven steep-sided mountains rising abruptly to heights of up to 1,800 feet. Cook particularly noted three of them and wrote in his diary, "these hills lay but a little way inland and not far from each other. They are very remarkable on account of their Singular form of Elivation which very much resembles Glass Houses, which occasioned my giving them that name". He was obviously reminded of the glass furnaces of his native Yorkshire.

The Glass Houses consist of trachyte and have the same origin as a number of similar features in eastern Australia, such as the Three Brothers, the Canobolas, and the Warrumbungle and Nandewar Ranges in New South Wales. Trachytes in the molten state are stiff and viscous. Since they are not very mobile, they form steep-sided masses when intruded into overlying sediments. When revealed on the surface by erosion they form spire-like peaks, plugs, and necks and give rise to rather spectacular scenery.

Space will only permit brief mention of a few of the many names given by Cook as he sailed north along the coast of Queensland and before he annexed the whole eastern coast in the name of George III on 22nd August on Possession Island, off the top of Cape York. Sometimes he would sketch and name a feature, but not mention it in his diary. Such was "one island more remarkable than the rest being of a small circuit very high and peak'd". It lies at the southern entrance to the Whitsundays Passage. It is almost certainly the feature he designated Pentecost Island in a sketch.

Mount Upstart is hard to find on maps of Queensland, but is presumably a granite mass like the nearby Cape Upstart that lies between Bowen and Ayr. It was prominent enough to attract Cook's attention.

Cook bestowed the name "Magnetical" on a granite island lying off the present site of Townsville, "because the compass did not traverse well when near it". This malfunction he attributed to the presence of "iron ore or other magnetical matter lodged in the earth". Subsequent navigators regarded Cook's assumption as unfounded.

Near disaster overtook them when, in the middle of one night, the ship struck and stuck fast on the sharp, jagged coral of the Great Barrier Reef. After throwing overboard cannon, ballast, and anything they could spare to lighten the ship, she floated off at high tide. A mat of wool, oakum, etc., was stuffed into the hole, fortunately partly plugged by a lump of coral that had broken off. The rate of intake of water markedly decreased, and a week later she was beached for repairs on the Endeavour River where Cooktown now stands. The sturdy, but very small, ex-collier out of Whitby lay high and dry from 17th June to 6th August while the carpenters and armourers repaired her.

Scientific work was carried on during the enforced stay. One redeeming feature was that their dreadful diet could be supplemented by palatable fresh food. Cook sketched and named a conical peak, Gore's Mountain. The name has not been retained, so all one can be sure of from the sketch is that it lay to the south of the Endeavour River.

Our readers who shared with the rest of the world the tension and concern over the safety of the men who made the first landing on the moon might try to imagine the feelings of Cook and his men when they sailed out of the Endeavour River realizing they were still in the treacherous waters of the reef and not knowing what lay ahead.

BOOK REVIEW

LANDFORMS OF COLD CLIMATES, by J. L. Davies (1969). The Australian National University Press, Canberra. 200 pp., 40 plates, 84 text-figures. Volume 3 in *An Introduction to Systematic Geomorphology*, edited by J. N. Jennings. Price \$5.

This small book is the second in an ambitious series of seven volumes by Australian authors. It might have been better to have titled it *Landforms of Quaternary Cold Climates in Australia*, because it is those sections dealing with Tasmania that have real bite and authority. The book reads as though it is a literature survey prepared carefully for senior geography undergraduates in Tasmania. It is weak in its coverage of the Snowy Mountains, let alone Macquarie and Heard Islands, Australian Antarctica, the New Guinea mountains, and New Zealand. On a global scale there is a neat presentation of general theory and knowledge, but neither the text nor two small maps on an unsuitable projection (fig. 8, p. 10) give a sufficient indication that permafrost regimes affect half of two major countries, the U.S.S.R. and Canada. Moreover, a sound analysis of the much smaller cold-climate regions of Australia is impossible without a careful consideration of Quaternary events, but INQUA (the International Association for Quaternary Research) is not mentioned, and the word Quaternary is not listed in the index.

Consequently, readers who want an understanding of the Australian cold-climate landforms should first read chapters 20 and 21 of Arthur Holme's *Principles of Physical Geology* and chapters 9 and 10 of Twidale's "Geomorphology". Readers should know also that there are many research institutes specializing in the problems of cold regions, and that extensive bibliographies are printed in each issue of the *Polar Record* and the *Journal of Glaciology* and by organizations like the Cold Regions Bibliography Section of the Library of Congress.

Some of the limitations of Davies' book reflect the fact that glacial and periglacial landforms are really of minor importance in Australia though significant in Tasmania and the Snowy Mountains. The book is notably free of typographical errors, and within its limits is accurate and well-written. It could be useful to some laymen, and very useful to senior undergraduates in geography. Locally, it has additional value as part of a series by Australian authors using Australian examples.—H. J. Harrington.

Eastern Australian Birds Recorded on the "Endeavour's" Voyage

By H. J. de S. DISNEY
Curator of Birds, Australian Museum

A Crow in England tho in general sufficiently wary is I must say a fool to a New Holland crow and the same may be said of almost if not all the Birds in the country.—Banks' journal.

AT the time, on 31st March, 1770, when Captain Cook, after consultation with his officers, decided to sail for the east coast of Australia, the western half and northern side already had been visited by Dutch explorers in the seventeenth century.

A description of the Black Swan (*Cygnus atratus*) was first given in 1636 by Antonie Caen, in command of the Dutch ship *Banda*, when he saw two stately black birds as large as swans with orange-yellow bills off the north-west coast of Western Australia. It was not until 60 years later that confirmation of Caen's description was made. On 7th January, 1697, De Vlaming visited what is now the Swan River and captured two young Black Swans, which are greyish-white and a similar colour to the cygnets of the White Swans of Europe. Other birds recorded there were cockatoos and parroquets and a "nightingale", which, it has been suggested, was the Reed Warbler (*Acrocephalus arundinaceus*). On 15th January a further landing was made near, apparently, Jurien Bay. There they "proceeded nearly a league and a half inland, but saw no men or fresh water, but several footsteps of men and a dog and of a kasuarius". This is the first indication that a bird like the cassowary, but in this case the emu, existed in Australia. The first emu specimen for science was obtained at Botany Bay in March, 1788, shortly after the First Fleet arrived.

Tasman anchored in Marion Bay, Tasmania, on 1st December, 1642. It was reported by the party that landed that at the far eastern end of the bay they had seen large numbers of gulls, wild duck, and geese. It is suggested that the "geese" were actually Black Swans.



The Red-tailed Black Cockatoo (*Calyptorhynchus banksi*), as sketched by Sydney Parkinson in 1770. [By courtesy of the Trustees of the British Museum (Natural History).]

Dampier's descriptions

The first good descriptions of birds and definite names given were by William Dampier on his second visit to Western Australia in 1699. As he approached the Abrolhos Islands he saw what were probably, from his description, Caspian Terns (*Hydroprogne caspia*). Two days later, on 1st

August, as they moved in to the coast, he saw gannets similar to those seen in Europe and sea-mews (an old name for gulls) with forked tails, which were probably Crested Terns (*Sterna bergii*). They landed on the shore of Shark Bay, which Dampier named. He saw very few land birds; these were small and some were nesting, as it was spring. The water birds he mentioned were curlews, goldens (possibly herons), crab catchers (oystercatchers), cormorants, gulls, and pelicans. He also made four sketches of four different kinds of birds. These are the first published sketches of any Australian birds and the first birds, after the Black Swans, which can be definitely identified. They are the Avocet (*Recurvirostra novaehollandiae*), Pied Oystercatcher (*Haematopus ostralegus*), Bridled Tern (*Sterna anaetheta*), and Common Noddy (*Anous stolidus*). On 22nd August, further north, he again landed and saw some white parrots, which would have been Little Corella (*Kakatoe sanguinea*), still common in the area. Later, on 28th August, he saw boobies and caught and described a Bridled Tern. He recorded "crows (just such as ours in England) small hawks and kites, also plenty of small turtle doves which were plump, fat and very good meat".

Cook's and Banks' observations

There was no further advance in the knowledge of Australian birds until Captain Cook arrived on the east coast 70 years later, with his naturalists, on their way from New Zealand. As they sailed across the Tasman Sea Captain Cook saw a Tropic Bird. This would have been the Red-tailed Tropic Bird (*Phaethon rubricaudus*).

Banks went shooting from a small boat on 11th and 12th April, 1770, and shot or saw the following: Wandering Albatross (*Diomedea exulans*), Black-browed Albatross (*D. melanophris*), Yellow-nosed Albatross (*D. chlororhyncha*), Soft-plumaged Petrel (*Pterodroma mollis*), Fairy Prion (*Pachyptila turtur*), White-headed Petrel (*Pterodroma lessonii*), Grey-backed Storm Petrel (*Garrodia nereis*). Banks also obtained a Sooty Shearwater (*Puffinus griseus*), originally named by Solander as *Nectris fuliginosa* and illustrated by Parkinson on plate 23 of his drawings. On 13th April, Banks saw a gannet; this would have been the Australian Gannet (*Sula*

serrator). He found the birds "unsuspicious of men, the generality of them flying to the boat as soon as they saw it, which is generally the case at great distances from land".

Captain Cook recorded on 16th April that he had seen an "egg bird". This was the sailors' term for the Sooty Tern (*Sterna fuscata*). This tern has rarely been recorded as far south as New Zealand, although it breeds on the Kermadec Islands, so Cook may have meant another kind of tern. On the 17th he saw a Port Egmont Hen or Southern Great Skua (*Catharacta lonnbergi*), named Port Egmont Hen by voyagers after Port Egmont, in the Falkland Islands, where they were common. Three days later, on 19th April, Cook noted "Pintado bird, several albatrosses and black Shearwaters". The "Pintado bird" is the Cape Petrel or Cape Pigeon (*Daption capensis*). The albatrosses and shearwaters would have been of several species. Cook continued: "The first of these birds are certain signs of the nearness of land". This was confirmed at daylight next day, when land was sighted.

First records of east Australian birds

Nine days later, having been driven northward by a gale, the *Endeavour* entered Botany Bay, and the first records of eastern Australian birds were made. Parkinson wrote that there were "a great number of birds of a beautiful plumage; among them two sorts of parroquet and a beautiful loriquet; We shot a few of them, which we made into a pie and they ate very well. We also met with a black bird, very much like our crow and shot some of them too, which also tasted agreeably". The crow was the Australian Raven (*Corvus coronoides*). Cockatoos were observed by Banks, and one day he "found a large quantity of quails much resembling our English ones...". The quail were either the Stubble Quail (*Coturnix pectoralis*) or the Brown Quail (*Synoecus australis*), or both, as these were in former times common in the area.

Twelve days after leaving Botany Bay the next note was made by Banks in his journal when he went out in a small boat in the evening at sea north of Wide Bay, Queensland. He recorded Frigate Birds (Man-of-war Birds) (*Fregata* species), Red-footed Gannet (*Sula sula*), and the Little Shearwater (*Puffinus assimilis*).

On 21st May Cook recorded species of booby, probably the Brown Gannet (*Sula leucogaster*). He said: "From half an hour before until half an hour after sunrise flights of them were continually coming from N.N.W. and flying to the S.S.E. and not one was seen to fly in any other direction. From this we did suppose that there was a lagoon or a river or inlet of shallow water to the south of us, where these birds resorted to in the day to feed, and that not far northward lay some island where they retired to in the night".

On 23rd May Captain Cook landed for the first time in Queensland, at Bustard Bay, south of Gladstone, so named by him because they saw bustards (*Eupodotis australis*). They shot one weighing $17\frac{1}{2}$ pounds, which they ate next day, and Cook said that their dinner "was not only good, but plentiful". This bustard was recorded by Solander in detail, and was the only Australian bird, except for sea birds, so recorded by him. Parkinson mentions the bustard and also a

duck which they shot. It had "beautiful plumage with a white beak, black body, and white and green wings". This was perhaps the White-headed Shelduck (*Tadorna rajah*). He also noted some very large pelicans (*Pelecanus conspicillatus*), "near five feet high".

Banks went ashore on 29th May and shot many of the same kind of loriquets he had obtained at Botany Bay. A week later, on 6th June, as the evening was calm he went out in a small boat near Cape Upstart and shot "*Nectris nuxax*". From the description of this bird, which was named by Solander *Nectris nuxax*, W. B. Alexander considered it to be *Puffinus lherminieri*, which is the only record of this species in Australian waters (see *Emu*, Vol. 27, 1928).

Endeavour River birds

On Monday, 11th June, 1770, the *Endeavour* struck a coral reef. Cook managed to get it off, and beached it in the river later called Endeavour. Cook only gave a brief and general account of the birds there, and the only birds mentioned by Banks during this stay were Whistling Ducks (*Dendrocygna* species). However, Parkinson noted the birds in more detail, giving the colours of the legs, eyes, etc. From these descriptions the following birds can be named: the Top-knot Pigeon (*Lopholaimus antarcticus*), "which ate very well"; Black-shouldered Kite (*Elanus notatus*); Bee-eater (*Merops ornatus*); Sooty Oystercatcher (*Haematopus unicolor*); Pied Cormorant (*Phalacrocorax varius*); and Brush Turkey (*Alectura lathamii*), described as "a bird like a Tetrao, having wattles of a fine ultramarine colour, and whose beak and legs were black". This was the northern Cape York form, in which the lower part of the neck and wattles are purplish-white (ultramarine of Parkinson), while in the southern form the neck is red and the wattles are yellow.

Other birds which were described, but which cannot be fully identified, are: goat-sucker or churn owl, probably one of the three Australian nightjars; an owl, one of the three species of the genus *Ninox* found in Cape York; a large black and white gull, which could be either the Pacific Gull (*Larus pacificus*) or the Dominican or Southern Black-backed Gull (*L. dominicus*). Both of these gulls might have wandered north, but neither has been recorded since as far north



The Australian Bustard (*Eupodotis australis*.) Captain Cook named Bustard Bay, Queensland, after it.



A painting published by Peter Brown in 1776 of a Rainbow Lorikeet (*Trichoglossus moluccanus*) which was brought back alive to England from Botany Bay.

as this in Australia, although the Pacific was recorded at Rockhampton in 1877. A bird which was almost certainly a Tooth-billed Catbird (*Scenopoetes dentiostriis*) was described as "a large olive bird of the loxia genus having the iris of its eyes of a gall-stone colour, the pupils of them black". Parkinson also recorded "several other sorts of hawks; large black cockatoos, with scarlet and orange feathers on their tails, and some white spots between the beak and the ear, as well as one on each wing". He made an unfinished pencil drawing of a female or immature bird. This was a Red-tailed Black Cockatoo (*Calyptorhynchus banksi*), and Banks has written on the back: "The whole bird black, spots on the head and shoulders dirty white; the breast feathers wav'd wt pale brown the outer feathers of the tail scarlet and yellow wt narrow fascia of black, the iris dark brown, the pupil black, the beak dirty

white with the point of the upper mandible dark grey". This is the only Australian bird drawn by Parkinson.

Island observations

On 12th August Banks visited Lizard Island, so named by Cook because of the number of lizards there. Banks saw many birds there, and found an eagle's nest with two young. This would have been the nest of the White-breasted Eagle (*Haliaeetus leucogaster*).

Captain Cook landed on Possession Island on 22nd August and formally took possession of the whole of eastern Australia. After passing Cape York on 23rd August, they landed on Booby Island, named after the large numbers of Brown Boobies (*Sula leucogaster*).

A bird caught on the rigging on 27th August "proved exactly the same bird as Dampier had described and given a rude figure under the name of a noddy of New Holland" (the Bridled Tern, *Sterna anaetheta*).

It is uncertain whether any birds were preserved as dried skins by Cook's naturalists, but one bird was certainly brought back alive. This was a Rainbow Lorikeet (*Trichoglossus moluccanus*), which had been obtained at Botany Bay and kept by the Tahitian Tupaia, and, unlike its owner, survived to reach England. Banks gave the bird to Marmaduke Tunstall and there Peter Brown saw it and published a coloured plate in his *New Illustrations of Zoology* in 1776.

It is interesting to note that no mention of Black Swans was made by any of the members of Captain Cook's expeditions, and these birds were not recorded on the east coast until the arrival of the First Fleet.

FURTHER READING

- Beaglehole, J. C., 1962: *The Endeavour Journal of Joseph Banks, 1768-1771*. Trustees of the Public Library of New South Wales with Angus and Robertson.
- Reed, A. W., 1969: *Captain Cook in Australia*. A. H. and A. W. Reed, Sydney.
- Whittell, H. M., 1954: *The Literature of Australian Birds*. Paterson Brokensha, Perth.



New Holland Mouse (*Pseudomys novaehollandiae*).

Australian Mammals Since 1770

By J. H. CALABY

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Quadrupeds we saw but few and were able to catch few of them that we did see. The largest was called by the natives Kangooroo.—Banks' journal.

THE Australian mammals are generally nocturnal and not conspicuous, and this was just as much so at the time of European discovery as now. The early European navigators on the western coast saw only wallabies on islands where their densities are often high and the vegetation is sparse; on the mainland they recorded only occasional dingoes. Although Captain Cook and his party landed at several places on the eastern coast and spent 2 months ashore at the Endeavour River, they fared little better. At Botany Bay they caught one native cat, and at the Endeavour River a Ring-tailed Possum with two young, a Horseshoe Bat, and three kangaroos. Apart from that, they saw a few flying foxes and dingoes. Only the kangaroos excited great interest, because of their size, their possibilities as a source of fresh meat, and their peculiar locomotion.

The voyage of the *Endeavour* was, however, of the greatest importance to the

mammals as to everything else Australian, because an English colony was established and the settlement of Australia commenced in 1788 as a direct result of Banks' glowing reports on Botany Bay. The first settlers were curious about the strange fauna, and specimens of new discoveries were quickly sent home to be described and catalogued. However, the fauna was alien and evoked no feelings of sentimental attachment, and only two categories were recognized—vermin and edible species, either of which provided skins for sale. This attitude was fairly general for at least the first century of European occupation, although a few local and visiting naturalists, such as John Gould, deplored the thoughtless destruction of fauna and warned that its future was insecure. At a later period, particularly in Victoria, wealthy landholders and leading natural scientists showed their contempt for the native animals by introducing "beneficial" British ones, often

with disastrous results, particularly in the case of the rabbit. The idea of legal protection of native fauna came relatively late. Although a law was passed in Tasmania in 1846 to restrain kangaroo hunting, the other colonial Governments did not introduce fauna protection Acts until the 1860's to the 1890's. These early laws were largely ineffective, as the Governments lacked the means and desire to enforce them. Even the well-administered modern Acts would be seriously jeopardized without a public appreciation of the value and interest of our unique fauna. From the earliest times a few individuals had such an awareness, but in general it is a recent phenomenon and largely an outcome of the development of amateur natural history and conservation societies.

Importance of habitat preservation

Except in occasional special situations, deliberate persecution and controlled hunting are not serious problems in fauna conservation. Some of the most heavily exploited species—for example, the Brushtail Possum (*Trichosurus vulpecula*) and Bennett's Wallaby (*Macropus rufogriseus*) in Tasmania—are as abundant as ever. And species hunted to low numbers in the past, such as the platypus (*Ornithorhynchus anatinus*) and koala (*Phascolarctos cinereus*), have demonstrated their capacity to recover in secure habitats when legally protected and the sale of their skins forbidden. It is abundantly clear that successful fauna conservation depends on the preservation of habitat and a knowledge of the effects on animals of alterations to the habitat.

Since the beginning of settlement tremendous changes have taken place in the natural plant covering. Large areas have been converted from forest and woodland to relatively treeless fields for growing crops and depasturing dairy cattle and other stock. Very much larger areas have been altered by grazing domestic stock and the rabbit. Swamp drainage, damming of rivers, and urban and other developments have all had their effects on the natural environment, including the animals. The accelerating increases in the human population and the pace of national development are altering the face of Australia at a faster rate than ever. Of all the animals the mammals seem to have been the most sensitive to changes in



Ring-tailed Possum (*Pseudocheirus peregrinus*).

the environment; a few species have benefited, but the story of most of them has been one of decline.

Increase in numbers of Red Kangaroos

Pastoral settlement in the lower-rainfall areas has led to large increases in the numbers of the Red Kangaroo (*Megaleia rufa*). The explorer Charles Sturt and his party saw extremely few in western New South Wales in more than a year in 1844-46, yet today they are abundant there. The original cover in much of this country was a sparse woodland of myall and other low trees, with a shrubby saltbush floor. Sheep grazing has converted it to a short grass community with considerably less tree cover, and that apparently suits the kangaroo much better than the original vegetation. Changes induced by cattle in the vegetation in central Australia have led to increases in the numbers of the Red Kangaroo. In northwestern Australia overgrazing by sheep has favoured the Euro (*Macropus robustus*) but there has

been a decline in the Red Kangaroo. Sheep suppressed the nutritious annual grasses and herbs favoured by the Red Kangaroo. The Euro is adapted to live on low-protein plants such as soft spinifex (*Triodia pungens*) which prospered under the overgrazing regime.

Few other mammals have benefited in this manner. Western Grey Kangaroos (*Macropus fuliginosus*) have probably increased in the lower-rainfall parts of Western Australia, South Australia, and western New South Wales where adequate areas of mallee or riverine woodland remain to provide shelter. In the higher-rainfall beef-cattle country in New South Wales and Queensland partial clearing of the grass-floored eucalypt forests has led to local increases in the numbers of the Eastern Grey Kangaroo (*Macropus giganteus*) and some of the larger wallabies by providing a greater amount of forest-edge for shelter adjacent to open feeding areas of nutritious grasses. The most adaptable of all Australian marsupials, the Brushtail Possum, has also increased in this situation as it prefers a more open habitat than the undisturbed forest.

Frustrating problem

A most frustrating aspect of the study of our mammals is that we have no clear idea of relative abundance at the time of European discovery and the beginning of settlement. We can only attempt a reconstruction from the anecdotes of early observers, the inadequate museum specimens, and such other evidence as bone deposits in Aboriginal middens and caves. The latter are largely accumulations left by predators, especially owls, and can give us information on changes of range and perhaps relative abundance. In some cases these deposits have been approximately dated by the radio-carbon method. From this evidence we know that some mammals had declined considerably before European occupation commenced. In southeastern Australia the bones of a number of species of native rodents are widespread and common in prehistoric cave deposits. One of them, the Broad-toothed Rat (*Mastacomys fuscus*), is known as a living animal only in small relict colonies in the Kosciusko National Park, New South Wales, and parts of southern Victoria and Tasmania.



Dingoo (*Canis familiaris dingo*). [Photo: H. J. Frith.]

Another one, the New Holland Mouse (*Pseudomys novaehollandiae*), was known from four specimens collected in New South Wales between 1840 and the 1880's, until it was found again in 1967 and 1968 in two small areas of coastal New South Wales. In southwestern Australia there is a similar situation; the bones of some rodents and small marsupials are common in cave deposits but the animals are rare or extinct in the region. One species of marsupial mouse, the Dibbler (*Antechinus apicalis*), was believed to be extinct as it had not been seen for over 80 years. In 1967, however, two or three specimens were trapped at one locality. One or two species survived into European times but seem to have become extinct soon after. The most interesting of these is the Broad-faced Rat-kangaroo (*Potorous platyops*) of which a few specimens were collected in southwestern Australia between the early 1840's and the 1880's. We know from cave and midden deposits that it was formerly widely distributed in southwestern Australia, on the southern edge of the Nullarbor Plain, on Kangaroo Island, and on the lower Murray in South Australia. There is no clear answer to the problem of the decline of these mammals. One popular theory is that deterioration in climate produced radical alteration to the habitat. Another reason suggested is that Aboriginal firing of the countryside produced extensive changes; there is abundant evidence that Aborigines burnt the vegetation on a large scale.

Greatest decline in mammals

The greatest decline in the mammals in historical times has taken place, paradoxically, in the broad band of lower-rainfall New South Wales, where the Red Kangaroo has increased greatly and other species of kangaroos are common. The region had an abundant fauna of rodents, small wallabies, bandicoots, and other small marsupials. The great majority have disappeared from the area and survive only in central Australia or Western Australia. A few, such as the Eastern Hare-wallaby (*Lagorchestes leporides*), White-tailed House-building Rat (*Leporillus apicalis*), and White-footed Tree-rat (*Conilurus albipes*), appear to have become extinct. One other, the Pig-footed Bandicoot (*Chaeropus ecaudatus*), has not been seen for perhaps 50 years and may also be extinct. Western New South Wales was heavily overstocked with sheep, and, by the early 1890's, the sheep population exceeded 15 million. About that time the area was invaded in large numbers by the rabbit and was hit by severe drought. Sheep numbers have never since reached half that maximum figure. Although the decline of the native mammals was not documented, there can be no doubt that they were unable to withstand this combination of habitat-destroying factors.

In Western Australia the greatest decline in native mammals has occurred in the most intensively farmed area, the sheep and wheat belt of the southwest. It is also the part of



Broad-toothed Rat
(*Mastacomys fuscus*)

Lesueur's Rat-kangaroo
(*Bettongia lesueur*)



the State where the rabbit occurs in greatest numbers. Although a considerable part of central Australia has never been grazed by domestic stock there seems to have been a reduction in numbers of many mammal species and a few have apparently disappeared from there. The rabbit has invaded the region, and, although it is generally scarce, periodically occurs in considerable numbers. It may have been chiefly responsible for the disappearance of Lesueur's Rat-kangaroo (*Bettongia lesueur*). This attractive animal once occurred from western New South Wales across southern and central Australia to the western coast. It is known for certain today only on a few islands off mid-Western Australia. It is the only burrowing member of the kangaroo family, and the rabbit quickly adopted its burrow systems.

The parts of Australia in which the mammals have suffered least in historical times are the higher-rainfall forested northern, eastern, and southeastern regions. Probably no species has become extinct in those areas, and grave fears are held for only one, the Tasmanian Tiger (*Thylacinus cynocephalus*). This is probably the only Australian mammal that has declined to near-extinction as a direct result of human persecution. Economic development has so far largely bypassed the tropical woodlands and forests. There has been a great amount of clearing of the forests in the east and southeast, but large areas of forest reserves and uncleared land remain. The changes caused by

commercial forestry operations, burning, etc., have apparently had no drastic effects on the mammals.

Throughout its history the development of Australia has been carried out with scant regard for fauna conservation. The wonder is that we have lost so few species of mammals. However, a considerable number have shrunk to scattered relict populations and are in urgent need of rehabilitation, if that is possible. Surveys are badly needed to discover what remains and where it is located. Scientific studies are also necessary to determine the basic requirements—food, shelter, and living space—of the various species and how these are affected by different land-use patterns and vegetation changes. Ideally, many more wildlife reserves are needed, under the control of fauna protection authorities; nevertheless, the maximum amount of such land can never be more than a small part of the total land area. Although large areas of land are reserved for various purposes, such as commercial forestry, water catchment, and defence facilities, so far little thought has been given to the management of such reserves so that wildlife can derive the maximum benefit consistent with the primary purpose of the reserves. There is also no reason why similar principles should not be adopted in the management of privately-owned land.

[The photos in this article are by E. C. Slater, except where stated otherwise.]

A "Paradise Lost"—the Kurnell Peninsula Since 1770

By N. CARTER

Director, Captain Cook's Landing Place Museum, Kurnell

Sunday, 29 April 1770. In the PM winds southerly clear weather with which we stood into the bay and Anchor'd under the South shore about 2 Mile within the entrance in 6 fathoms water, the south point bearing SE and the north point East.—Cook's journal.

FROM the time of early settlement to the present urban and rural development, which has continued at a great pace throughout Australia, there has been very little done to record the transformations which have so considerably altered the landscape.

The public in general has no conception of the land as it was in its original state. It would appear that they take it for granted that as it is today, so it was yesterday.

Research is still incomplete, but there is sufficient material to relate some of the history of events which led to the present desolate conditions on the Kurnell Peninsula. Before outlining these events I must stress that the Peninsula today bears no resemblance whatsoever, except probably for one or two small pockets, to the day when Captain James Cook landed on its shores, 29th April, 1770.

Kurnell Peninsula is situated at the entrance to, and on the southern shores of, Botany Bay, extending some 7 miles southwards to Cronulla. At its northern extremity, Hawkesbury Sandstone is the dominant formation. Dating back some 160 million years ago, the Hawkesbury Sandstone bends into a broad depression under Botany Bay and does not reappear until Cronulla. It would seem that, when Botany Bay was far greater in size than it is today, the northern section of the Peninsula was an island, with the sea entering the bay between it and Cronulla. Over a period of time the silts and sands brought down by local rivers and watercourses gradually formed layers over the Hawkesbury Sandstone, creating a barrier between the island (Kurnell) and Cronulla. Evidence indicates that the barrier could have originated at the centre of this entrance,

and then extended north and south to eventually join Kurnell and Cronulla. The age of the Peninsula sand dunes has been estimated at somewhere in the vicinity of 10,000 years.

Before the arrival of Captain James Cook, the Aborigines (Gweagal tribe) had been in occupation of the Peninsula for up to 8,000 years or so. At what period during the early part of the 19th century they abandoned their mode of living and drifted northwards to the settlement at Port Jackson is impossible to say, as there appears to be no written record.

Peninsula's original appearance

To determine the original appearance of the Peninsula it is necessary to examine extracts from both Cook's and Banks' journals of an excursion they made on 1st May, 1770, from the watering place, Captain Cook's Landing Place Historic Site, along the Peninsula just about to Cronulla.

Cook wrote:

This morning a party of us went ashore to some huts, not far from the watering place where some of the natives are daily seen: here we left several articles such as cloth, looking-glasses, combs, beads, nails etc.; after this we made an excursion into the country which we found diversified with woods lawns and marshes. The woods are free from undergrowth of any kind, and the trees are at such a distance from one another that the whole country, or at least part of it, might be cultivated without being obliged to cut down a single tree. We found the soil everywhere except in the marshes to be a light white sand and produceth a quantity of good grass which grows in little tufts about as big as one can hold in one's hand; and pretty close to one another: in this manner the surface of the ground is coated. In the woods between the trees Dr Solander had a bare sight of a small animal something like a rabbit, and we found the dung of an animal which must feed upon the grass, and which we judge



Kurnell Peninsula about 26 years ago, before development. The township of Kurnell (lower right foreground) is quite small, and the beach near it, which faces into Botany Bay, shows no sign of erosion. The old track from Kurnell to Cronulla is clearly visible. The foreground is the entrance to Botany Bay; the ocean is at left. The extensive white area at right is sand dunes. [Photo by courtesy of the Captain Cook Landing Place Trust.]

could not be less than a deer; we also saw the track of a dog or some such like animal. We met with some huts and places where the natives had been and at our first setting out one of them was seen; the others I suppose had fled upon our approach. I saw some trees that had been cut down by the natives with some sort of blunt instrument, and several trees that were barked, the bark of which had been cut by the same instrument; in many of the trees especially the palms were cut steps of about three or four feet asunder for the convenience of climbing them. We found two sorts of gum one sort of which is like Gum Lac; it is extracted from the largest tree in the woods.

Cook also recorded:

In the woods are a variety of very beautiful birds such as Cuckoos, Loryquits, Parrots etc and crows exactly like those we have in England. Water fowl are no less plenty about the head of the harbour where there are large flats of sand and Mud on which they seek their food, the most of these were unknown to us, one sort especially which was black and white and as large as a goose, but most like a pelican.

Describing the same trip Banks wrote:

The Capt Dr Solander, myself and some of the people making in all 10 musquets resolved to make an excursion in to the country. We accordingly did so and walked till we completely tired ourselves which was in the evening seeing by the way only one Indian who ran from us as soon as he saw us. The soil wherever we saw it consisted of either swamps or light sandy soil on which grew very few species of trees one of which was large yielding a gum much like sanguis dracoris but every place was covered with vast quantities of grass. We saw many Indian houses and places where they had slept upon the grass without the least shelter; in these we left beads ribbands etc. We saw one quadruped about the size of a Rabbit.

My greyhound just got sight of him and instantly leapt himself against a stump which lay concealed in the long grass; we saw also the dung of a large animal that had fed on grass which much resembled that of a stag; also the footsteps of a small animal whose feet were like those of a polecat or weasel.

From the observations by Cook and Banks, and available accounts of the First Fleet, it can be assumed that the fauna which existed on the Peninsula at that time was extensive and varied. A probable list would include: the Southern Short-nosed Bandicoot (*Isodon obesulus*); members of the kangaroo family, Great-grey or Forester, and the Red-necked Pademelon (*Thylogale thetis*); dingoes (*Canis familiaris dingo*); the Eastern Native Cat (*Dasyurus viverrinus*), the Brush-tail Possum (*Trichosurus vulpecula*); parrots and lorikeets of several species; the Red-tailed Black Cockatoo (*Calyptorhynchus banksi*); any number of duck species; the Australian pelican (*Pelecanus conspicillatus*); the Australian raven (*Corvus coronoides*); the Brown Quail (*Synoicus australis*), which was abundant in the area in the early days of the settlement and which was still to be seen 10-15 years ago; and a large selection of bird life.

After the arrival of the First Fleet on 18th January, 1788, and before the transfer to Port Jackson a week later, a site was selected near Point Sutherland (Captain Cook's Landing Place Historic Site) as suitable for the proposed settlement. The land was cleared and wells were dug for



Above: Changes which have taken place, since development began, on the Kurnell Peninsula's Pacific Ocean shoreline from Boat Harbour (the small bay just left of centre in the foreground) to Potter Point (extreme right foreground). The growth of the township of Kurnell (to the left of the pier in the background) can be seen when compared with the photo on the previous page. Captain Cook's landing place is a little to the right of the pier. In the far background is the other side of Botany Bay. *Below:* Erosion along the Peninsula's cliff tops (foreground) at the entrance to Botany Bay and the effects of development generally are apparent in this photo. Regeneration is taking place along the dunes fronting the ocean (the extensive white area in the background). Both these photos were taken late in 1968, and are published by courtesy of the Visual Education Centre.



water. After the departure from Botany Bay and the establishment of the settlement at Port Jackson, there was considerable movement both by land and by sea to Botany Bay.

Regimental buttons found

In 1931 there was a find amongst the middens at Quibray Bay (Botany Bay side of the Peninsula) of two regimental buttons blackened with age, one appearing to be a relic of Governor Macquarie's regiment, the 73rd, brought out from England by him in 1809, and the other bearing the inscription of the 19th Highlanders. A half-crown piece of the reign of King George IV, dated 1820 and in good condition, was also found. Odd pieces of relics dating from the early 1800's can still be found today.

Permanent settlement on the Peninsula started in June, 1815, when Captain James Birnie was given a grant of 700 acres at Kurnell. Captain Birnie engaged in cattle and timber. John Connell purchased the land from Captain Birnie in 1828, and in 1851 the property passed to his grandson, John Connell Laycock. Laycock was for a time the member in the Legislative Assembly for Central Cumberland. He owned 12,000 acres at Kurnell, so that the property extended as far as Cronulla and Port Hacking. The property was mortgaged in order to purchase the Prince of Wales Theatre (later known as the Theatre Royal), which was subsequently burnt down. The insurance was faulty and Laycock lost his money. The fire was the cause of the family moving to the Clarence and the 12,000 acres were sold at 5 shillings an acre to the Hon. Thomas Holt in 1861.

Peninsula as "site for obnoxious trades"

During the early 1880's the Peninsula was selected by the authorities as a future industrial site for obnoxious trades, apparently a decision which was never changed.

The Botany Bay shore-line of what is now Captain Cook's Landing Place Historic Site was to have been subdivided during the 1890's, but fortunately the then Minister for Lands, the Hon. J. H. Carruthers, prevented this move and had the land dedicated as a public park on 6th May, 1899.

From 1900 onwards a number of attempts were made for a proper road to be built from Cronulla to Kurnell. The road did not come until 1953, with the construction of the oil refinery. Prior to this, access to Kurnell was by ferry and a track through the sandhills. In the past 15 years industry and, with it, housing have considerably increased. There is no doubt that greater development and changes will be made to the present landscape in the near future.

Probably the major cause of the conditions that now prevail occurred when the timber-cutting rights were sold during the late 1860's, and the land between Kurnell and Cronulla was stripped of timber, allowing erosion to commence in the form of moving sand, which, as it progressed, engulfed the remaining vegetated land. The quantity of timber taken from the Peninsula during the last century will never be known. Grazing of cattle and sheep was another contributing factor in the process of deforestation. With the settlement of the Peninsula and the clearing of timbered areas, the fate of the fauna was sealed.

A desolate waste

In 1931 Rolfe recorded that the land between Kurnell and Cronulla was a desolate waste of flat ground, covered with scattered shells and exposed roots of large trees, indicating that the old surface was once much higher. (These same stumps can be seen today.) One large stump, 10 feet in circumference and standing 6 feet high, had roots that branched out 5 feet above the then ground level. There were several such large stumps in the vicinity, all with tremendous roots, in some cases 11 inches

thick. He also noted that the Aboriginal camping ground at Quibray Bay was completely covered by a barren waste of sand, blown up by the southerly gales from the ocean beach. This was evident on examining the countless dead trees and vainly searching for any semblance of vegetation. In some parts, the advancing wall of sand was 60 feet high. In many places the remaining trees were almost completely engulfed and their bare upper branches "bore testimony of a vain struggle against merciless Nature. Truly a parallel with the Aborigine's struggle against another white advance".

Janet K. Doak and Catherine Macaulay-Doyle in a joint field study in 1928 noted that all the central basin of the Peninsula was very low-lying and covered with water after rain. The floor was more peaty than sandy, and the sand seemed to be merely a surface covering. The stumps and roots were so large that the trees must have been very large. No trees of the same dimensions, nor conditions suitable for them, were to be found for miles on either side. The vegetation round the bay and over the sandhills was stunted and extremely xerophytic, and the trees were not xerophytic, judging from the size of the stumps, although Janet K. Doak and Catherine Macaulay-Doyle could not detect the genus. (Through the co-operation and assistance of the Forestry Commission, Division of Wood Technology, samples of wood taken from the remains of tree stumps early this year were identified as *Eucalyptus botryoides*.) This led to the conclusion that very different conditions existed at one time, and that before the migration of the sand there was a marshy tract of country at a level 3 or 4 feet higher, where large luxuriant trees flourished.

No traces have been found of the palm trees mentioned by Cook. These were probably Cabbage Tree Palms (*Livistona australis*). Banks wrote in his account of New South Wales: "Palms here were of three different sorts. The first which grew plentifully to the Southward had leaves pleated like a fan; the Cabbage of these was small but exquisitely sweet and the nuts which it bore in great abundance a very good food for hogs". The only palms now growing on the Peninsula are to be



After heavy rains water lies in the central basin of the Kurnell Peninsula between Quibray Bay and the ocean-front dunes. Scattered throughout the basin are the stumps of large trees which once grew there. Those seen above are the remains of *Eucalyptus botryoides*. The moving dunes in the background cover other remnants of vegetation. [Photo: C. V. Turner.]

found near the creek which runs to the Endeavour watering place, located in Captain Cook's Landing Place Historic Site.

Kurnell Peninsula was the first place in Australia where botanical collecting and studies were made. Of the plants collected by Banks and Solander many are still to be seen, but quite a number are in the process of disappearing through various influences. These influences include erosion, bushfires, drought, infestation by parasites, noxious weeds, and possibly pollution, which in a broad sense has yet to be studied.

Destroyers of flora

Between 1900 and 1920 there were a number of devastating bushfires that swept the Peninsula from Cronulla to Kurnell. Coupled with erosion, the bushfires assisted in the process of the destruction of flora, as is evident by the charred remains of *Banksia integrifolia* stumps to be found in the Potter Point area.

Other factors which have added to the destruction of flora include not only severe drought conditions from time to time and gales with wind velocities up to 70 m.p.h., but also human activities.

The transformation from Cook's and Banks' descriptions of Kurnell Peninsula to that of an entirely different profile is just one of the countless instances of the same kind of change that have occurred throughout Australia. One can only wonder whether we are repeating the same mistakes today that were made during the last century.

What the future holds for the Peninsula can only be guessed at the moment. Will there be a repetition of past events, or will there be a rediscovery and eventual re-creation of the "Paradise Lost"?

FURTHER READING

- The Journals of Captain James Cook*, volume I, edited by J. C. Beaglehole.
- The Endeavour Journal of Joseph Banks*, volumes I and II, edited by J. C. Beaglehole.
- "Trial Excavations in Captain Cook's Landing Place Reserve, Kurnell, N.S.W.," by J. V. S. Megaw, *Newsletter*, vol. II, no. 9, October, 1968. Australian Institute of Aboriginal Studies.
- Aboriginal Technology, Some Evidence from Kurnell Peninsula, Botany Bay*, by F. P. Dickson, 1968, the University of New South Wales.
- "The White Heart of Cronulla", by Janet K. Doak and Catherine Macaulay-Doyle, *Sydney University Science Journal*, 1928.
- "An Aboriginal Midden at Quibray Bay," by J. S. Rolfe, *Mankind*, July and December, 1931.



The first of the *Endeavour's* cannons found, just after it was lifted on to the deck of the recovery vessel, *Tropic Seas*.

THE RECOVERY OF THE “ENDEAVOUR’S” CANNONS

By JAMES C. TYLER

Associate Curator, Department of Ichthyology and Herpetology, Academy of Natural Sciences,
Philadelphia, U.S.A.

Orders were now given for lightning the ship which was began by starting our water and pumping it up; the ballast was then got up and thrown over board, as well as 6 of our guns (all that we had upon deck).—Banks' journal.

THE 1969 Barrier Reef Expedition of the Academy of Natural Sciences of Philadelphia was a dual venture: searching for the cannons and other durable articles jettisoned from the *Endeavour* by Captain James Cook in 1770 off Queensland, and collecting reef-dwelling fish for scientific study in the Departments of Ichthyology of that Academy and of the American Museum of Natural History, New York City.

As the reader probably will know, the jetsam search was a great success. The exact spot where Captain Cook went aground on Endeavour Reef, about 13 miles off the coast

between Cooktown and Cairns, was discovered. Cannons as well as several tons of iron and stone ballast were retrieved and turned over to the proper Australian authorities for restoration and ultimate dispersal to appropriate institutions. Much publicity attended this aspect of the expedition, once the initial release of our discovery was made, and, as is often the case, many of the stories and accounts printed in various international newspapers were extremely garbled and conflicting.

Little known to the reader is the other side of the expedition—the reef fish collecting.

Probably between 30,000 and 40,000 specimens, for the most part very small reef-dwellers, representing perhaps 250 species, were obtained and shipped to Philadelphia and New York for sorting and study. Many of these specimens will be sent later to specialists throughout the world who are working on particular families of these reef fish. Several of these specialists are at the Australian Museum, and therefore many of our specimens will make their way back to Australia, exemplifying the continuous international flow of specimens and information between recognized authorities on various groups of organisms. However, the reader probably would be more interested in hearing about the cannon part of the expedition than the fish part. Let me, then, briefly summarize the ichthyological pursuits before turning to the more glamorous Cookiana.

Fish research

The fish research had many aspects, for two independent researchers were involved. Both had their own programmes to pursue along with helping each other and the jetsam recovery work. For myself, I wished to make a general representative collection of Barrier Reef fish to complement numerous collections from the Indo-Pacific already at the Academy, for Barrier Reef fish are relatively poorly represented in major museum collections of the world, except, of course, that of the Australian Museum. But we wished to have at least a good sampling of Barrier Reef fishes in our Academy collections, if only so as not to have to bother our friendly colleagues in the fish department of the Australian Museum every week or so when we needed to have a look at one of the numerous representatives of the Barrier Reef ichthyofauna.

My ichthyological colleague on the expedition, Dr C. Lavett Smith, of the American Museum in New York, concentrated on sampling the diversity of species in the various types of reef structure and ecological niches. His work is similar to that being carried out by Dr Frank Talbot and his excellent group from the Australian Museum at One Tree Island, next door to the famous Heron Island resort and marine laboratory. Dr Smith samples the species composition of the fish community and the numbers of individuals per species in every major subdivision of the reef. He also does repetitive sampling at the

same spot on the same reef at various time intervals, ranging from 6 hours to 6 days or longer, in order to analyse re-invasion of the reef area—what species repopulate the area after the existing fish fauna has been removed—as well as to obtain a relatively complete census of the fish of a very limited and ecologically well defined area of a reef.

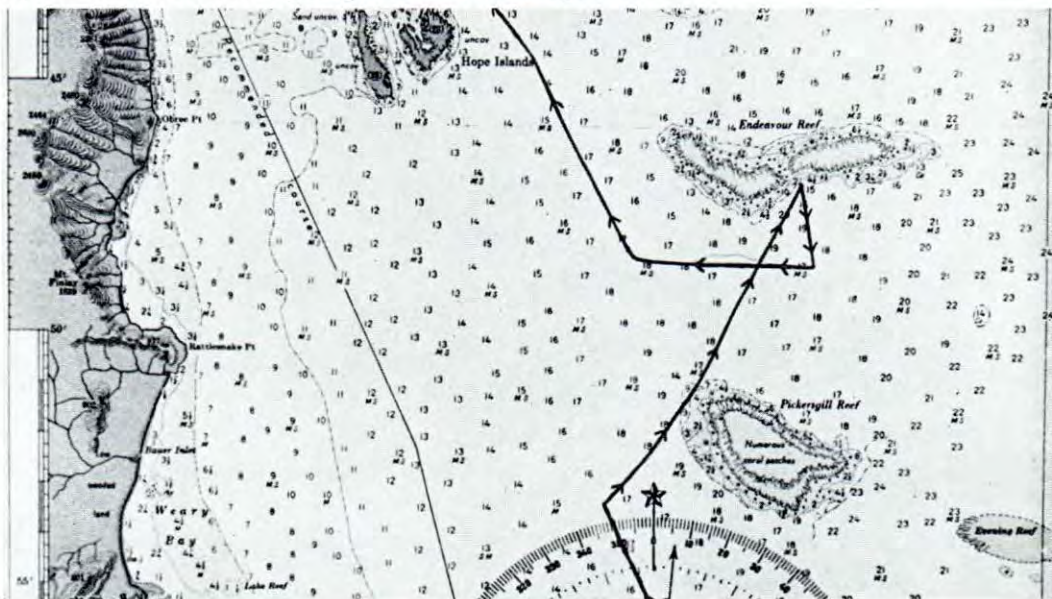
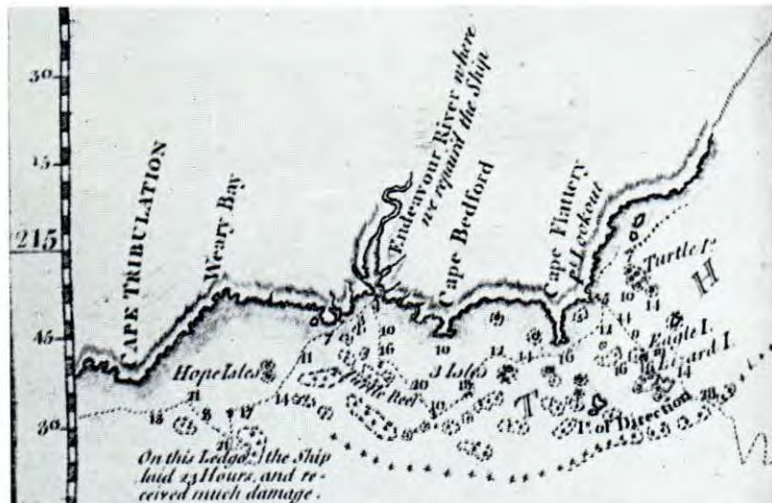
Fish toxicants

Both his work and my general fish collecting are done with rotenone-like fish toxicants—synthetic ketones based on the active substance in the derris root long used by South American Indians, who beat the roots against logs in fresh water to asphyxiate fishes—taken below with the use of scuba gear. Small amounts of rotenone are squirted from plastic squeeze bottles into a limited area of the reef, a few square feet or so, and the stunned fish are collected with small hand-nets—much like chasing butterflies. When properly used, no permanent damage is done to the reef or its total fauna, for only a small area is assayed and organisms from unaffected nearby areas immediately start invading the sampled area when the rotenone has been sufficiently diluted by the constant currents—within less than an hour or so. We use rotenone because it is one of the few methods we have of sampling the often secretive and usually small fish which live within the crevices of the reef and which simply cannot be caught by pulled nets, traps, trawls, or hook and line.

In discussing our ichthyological plans with various Australian Government authorities before the expedition, we had been asked by Mr G. Harrison, Chief Inspector of Fisheries, in Brisbane, to keep an eye out for *Acanthaster*, the Crown-of-thorns Starfish that has received so much attention of late. At least around Endeavour Reef and the close-by Hope Islands, this starfish seems to have a relatively low population density. While often secretive and concealed under overhangs, these are also places where we look for fishes, and during our month of scuba diving in this region of the reef we saw no more than a dozen specimens of this starfish.

Let us now return to the cannon side of the expedition, with only one last biological thought. Even though Dr Talbot and his Australian Museum group, the researchers of the University of Queensland and of other

Right: Detail from Cook's charts of the Queensland coast, showing his course (dotted line) before and after the grounding, with his comment: "On this Ledge the Ship laid 23 Hours, and received much damage". Below: Detail from a modern chart of the Endeavour Reef region, with an approximation of Cook's course (dark line). The *Endeavour* sailed over the shoals at the northwestern end of Pickersgill Reef, and later grounded about the middle of the southern edge of Endeavour Reef.



universities, the Great Barrier Reef Committee and its Heron Island Laboratory, and outside investigators from other parts of the world, are trying to make the biology of the Barrier Reef better known, the surface has only been scratched. So much stimulating and rewarding work needs to be done that the whole of this issue of the magazine could be devoted easily just to a list of "things to be done". Nowadays, in the United States at least, one must have a slogan to march with; mine would be: "Support your Great Barrier Reef Committee".

Origins of expedition

The discovery of Captain Cook's jetsam this year seems most happily timed; just one year before the bicentenary of his discovery of the east coast of Australia. In fact, that was one of the compelling reasons for the expedition at this time, but the thought behind the expedition dates back about 10 years. At that time, Mr Virgil Kauffman, the leader of the expedition, was the president of Aero-Services Corp., of Philadelphia, Pennsylvania. A renowned aerial surveyor for oil and minerals, Mr Kauffman was doing some work

in the north of Australia. During a few days interlude in the business on hand, he chartered a boat in Cairns to take him out to see the Great Barrier Reef. Mr Kaufman, as an explorer in his own right and a member of the Explorers' Club of New York, had long admired the magnificent record of Captain Cook on the three historic voyages, in which he excelled in navigation, leadership, and scientific worth. The captain of the boat that Mr Kauffman chartered that day in Cairns was equally interested in, and knowledgeable about, Captain Cook, and thus Vince Vlasoff, master and owner of the *Tropic Seas*, found himself with Mr Kauffman spending the night anchored off Endeavour Reef. Soon the talk turned to Captain Cook and his near disastrous wreck on Endeavour Reef, and Mr Kauffman became determined to search for the wreck site, with the possible use of geophysical tools, such as a magnetometer. A magnetometer is a sensitive piece of electronic gear that can pick up minute variations in the magnetic field of the earth's crust above or below water, an instrument carried by land, sea, or air, whose development and commercial application Mr Kauffman had pioneered.

Mr Kauffman subsequently contacted the British Museum about the metallic composition of Cook's cannons and the history of the first voyage, being aided in this by Dr Helen Wallis, who was in charge of Cookiana. But the press of business mostly kept him away from the project until his retirement, at which time he was joined in the pursuit by his friend and fellow aviator, Brigadier General Alfred L. Wolf, whose law firm is in Philadelphia. Both men are avid naturalists and interested in the history of exploration, and Gen. Wolf is an accomplished scuba diver who had previously worked with Mr Edward Link of the *Sea Diver*, on Caribbean galleon recoveries.

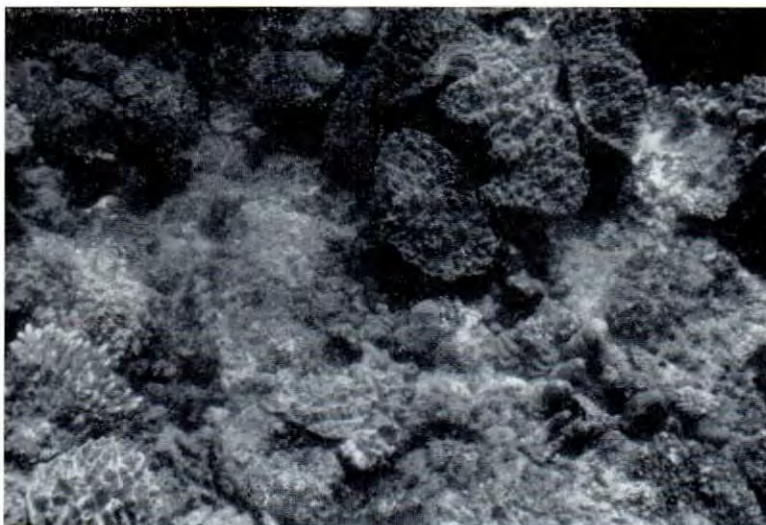
The two approached the Academy of Natural Sciences of Philadelphia, of which they are members, about sponsoring a joint expedition to study Barrier Reef fish and to look for Cook's jetsam. The idea was enthusiastically received. The ichthyologists could search for fish just as well on Endeavour Reef as they could anywhere else, and the data available indicated Endeavour Reef to be the most reasonable site for Cook's grounding, as long thought by cartographers. We were well aware that many other groups had

searched for Cook's jetsam on Endeavour Reef without success. Some had thought, for this reason, that the grounding had occurred on another nearby reef. However, our comparison of the modern hydrographic charts with the chart of the region given by Captain Cook in his journals and his terse statements about his course, heading, and speed just before the grounding, made Endeavour Reef the logical choice. But it was still not the only choice. Mr Kauffman decided to concentrate the magnetometer survey first on Endeavour Reef. It was our reasoning that the numerous other expeditions intent on finding Cook's jetsam had not been successful because they did not have the proper sophisticated equipment and, due to poor weather, had not been able to spend enough time surveying the windward side of the reef that Cook certainly hit. The windward side can be usefully worked on only during calm periods, especially during the "doldrums", approximately from November to January between the turning of the southeast trade winds and the northwest monsoons.

Endeavour Reef is about 5 miles long, and divided into an eastern and western half by an irregularly-lower middle region. An unaided visual search for the jetsam would take many years to complete, even if it was completely exposed and just waiting to be discovered. Five miles is a lot of reef! Obviously, after nearly 200 years, the cannons and ballast would be almost unrecognizable, and covered with sand or some combination of coralline algae, hard or soft corals, anemones, and other sessile invertebrate growths.

Our planning sessions in Philadelphia were taking place in the middle of 1968, and letters were sent to innumerable Australian institutions and individuals, asking for advice on weather conditions, boat chartering, availability of diving equipment, etc., for such an expedition. Because of the long distance involved, and the inevitable answering letter which posed more questions than we had anticipated, it was decided at a conference between Dr H. Radclyffe Roberts, Director of the Philadelphia Academy, Mr Kauffman, Gen. Wolf, and myself, that one of us must hurry off to Australia to gather first-hand data on all these factors, ask every question imaginable, and record the answers for discussion at a conference as soon as possible

Right: The first cannon found, in situ, with coral overgrowth untouched; the butt of the cannon is at the bottom of the photo, just left of the centre. This was the most easily seen of the six cannons. *Below:* The cannon, after two expedition members had spent two full days chipping away coral and tunnelling beneath to attach cables. The dark object to the left of the butt is a passing fish.



Conference's decision

At our conference after my reconnaissance trip it was decided to go ahead with the project early in the coming year, even though the weather seemed likely to be better in November or December. But November was too early to mount the expedition because of logistic problems, and December was ruled out because of Christmas (we are all married and there were many children and grandchildren to be considered). This left January, about the middle of which month the winds usually start up again and the rains are heavier. We gambled that the winds would be slow in returning and that we could get most of our work done in the first 3 weeks of the month.

After spending Christmas at home, we left San Francisco by Qantas and arrived in Cairns on 29th December. We spent several days loading Captain Vlasoff's vessel with all that remained of our expedition gear, most of which he had already efficiently sent to Little Hope Island, our base of operations. The gear included diving tanks, compressors for filling them, fish collecting and preserving equipment, camping gear, outboard engines, helicopter fuel, and a thousand miscellaneous items. These many tons of impedimenta were manhandled onto the beach at Little Hope Island, about 5 miles northwest of the western end of Endeavour Reef, and arranged under the watchful eye of Mr Allen Gill, our camp master, on leave from the Electricity

after his return to Philadelphia. Being the youngest and temporarily least tied-down, I was pleasantly told to leave immediately—a not undesirable command in the light of what I knew of Australia from several friends from college days, who had either been there or were Aussies themselves. Three weeks of fact finding and discussions with many helpful people during September, 1968, gave us the data we needed.

Board of Cairns; Mr Michael Mansfield, an Australian medical student on vacation; and Mr Charles Jackson, mate and superb cook of the *Tropic Seas*. With our gear stowed away, and comfortable in our tents not many yards away from a refrigerator containing reasonably cold beer, we slept a good night's sleep before waking at the crack of dawn for the start of the day's activity—putting back aboard the *Tropic Seas* many of the items we had just offloaded, but which we now needed for the work at hand.

Search begins

The search for the jetsam began on 4th January, with Mr Kenneth Myers, our magnetometer operator and head of Seaborne Electronics, New Orleans, Louisiana, at his instruments in our runabout, while Mr Griscom Bettie, a Philadelphian who is a chief test engineer of the new high-speed railroad line between Boston and Washington, D.C., and a sportsman, scuba diver, and engineer par excellence, piloted the boat in the precise grid pattern laid out for the magnetometer search operations. During this initial exploratory period, the *Tropic Seas* went out of commission from a mechanical failure, and while new parts were being obtained, Captain Vlasoff arranged for Captain Kevin Lamberton to bring his *Nancy E* up from Cairns to assist us for a week.

We had started the magnetometer search pattern by boat, in order to eliminate a few theoretically unproductive areas (according to our analyses) at each end of Endeavour Reef, until our charter helicopter arrived in a few days to begin the more serious survey work. The helicopter held many advantages over a boat, for it could survey in wind and rough seas that would be too much for the small runabout on the windward side of the reef, and it was much quicker. But the days were gloriously warm, sunny, and calm, and the runabout under Grissy Bettie's supervision was able to cover a grid pattern over much more of the reef than we had envisioned.

Our analyses of the various renditions of the journals of Captain Cook and of Sir Joseph Banks (especially those so brilliantly edited by Dr Beaglehole, of New Zealand) and those of Sidney Parkinson and others on the first voyage had led us to believe that certain areas on the south side of Endeavour Reef were more likely to be productive than others.

First cannon found

On 7th January, a few days before the helicopter chartered from Rotorwork, in Sydney, was due to arrive from New Guinea, the magnetometer in the runabout picked up "good vibrations", which, upon closer inspection with the instrumentation of the magnetometer set at a more delicate scale, proved to be major "anomalies" in the magnetic field in about the middle of the south side of the reef. There had been a few small "anomalies" in the readings in working west to east from the western edge of the reef, but nothing to cause great excitement. But now the eyes of Ken Myers and Grissy Bettie were ablaze. "We've got it. We've got it. The goods are there. Look within a 10-foot radius of where we've thrown the marker buoys."

Divers donned their regalia and investigated. Sure enough; the goods were seen, even though partially buried and heavily overgrown with various organisms. At the first buoy we saw a distinctly rectangular form, which later proved to be a block of iron ballast. Grissy, Wolfy, and I explored this area and found more iron pigs and stone ballast, while Smitty swam over to the other buoy and discovered the unmistakable outlines of a cannon. Subsequently, Captain Vlasoff chiselled off a chunk of the encrusting layer on the cannon, revealing the black, superficially oxidized surface. But, assuredly, the jetsam would never have been seen if the magnetometer had not shown us where to look.

It was an exhilarating moment for all involved, both above and below. We had thought that we had a good chance of finding Cook's jetsam where others had failed, due to better equipment, better weather, and better luck. We now knew that a good deal of time, money, and effort on many people's parts, in some cases over a period of years, was bearing fruit, and that not only was the fish collecting going successfully, but that the far more risky jetsam search had, after all these years and attempts, come to an end. With everyone finally back on the *Nancy E* for transfer to the *Tropic Seas* at the end of the day, we could hardly wait for the sunrise to see us back in the water chiselling against the coral-encrusted cannons and pig-iron bars that were effectively welded to the ocean floor. The underwater work was going to be easier



One of the least buried and most obvious pieces of iron bar ballast, weighing about 300 pounds, with an underwater buoy for use in surveying the position of the cannons and ballast.

than we had anticipated, for the bottom depth at the site was only about 15 feet at low tide; we had thought that the jetsam probably would be in 20 to 40 feet depth, and we were prepared for working at 100 feet depth.

“Ferro-magnetic anomalies”

That first day of discovery had revealed to us the location of one cannon relatively easily recognized, along with piles of iron bars and scattered stone ballast. Yet Ken Myers had marked out a number of other spots with buoys which his magnetometer said had “ferro-magnetic anomalies”, but we divers could not see anything easily recognizable as jetsam in these places. Subsequently, the General and Grissy found, after much probing and chiselling, that there were cannons very near these buoys. Smitty and I called off our fish collecting for the duration and joined Grissy and the General as diver-reclaimers.

Grissy was in charge of the recovery diving operation, conferring with the group at the end of each day back on the *Tropic Seas* to decide what we should do next. As good an engineer below water as on a railroad track, he magnificently managed the often difficult

task of having us all work efficiently together in chiselling free four cannons and much of the iron ballast by 14th January. The stone ballast was not strongly cemented to the bottom, and thus was easy to pick up. Two of the cannons and some of the iron and stone ballast had by now been winched aboard the *Tropic Seas* by Captain Vlasoff for transport back to Little Hope Island. There they were deposited on the bottom just below low-water mark in order to keep them constantly in sea-water. During these 1-hour trips between Endeavour Reef and Little Hope, Gen. Wolf kept a continuous flow of sea-water running over the cannons and ballast. Virgil Kauffman and his aviator friend Alfred Bertolet, who, as our back-up pilot and provider of last-minute expedition supplies, had joined the expedition later than the rest of us, proceeded to fly by helicopter to Cairns to officially report our findings to Mr W. Douglas, Receiver of Wrecks. During these and the subsequent few days of hectic recovery activity, a total of four cannons and much iron and stone ballast were retrieved and sent to Little Hope, to be picked up later by Mr Douglas and placed aboard the Government M.V. *Wallach* for transport to Cairns for temporary storage in vats of sea-water before being sent elsewhere for restoration by Australian Government scientists. With this much accomplished, we decided (with some friendly dissent among us) that 17th January would be our last day of recovery work, for the ichthyologists had to return to their prime pursuit of full-time fish collecting and several other expedition members had to head home. Our magnetometer had located the sites of the two remaining cannons, but it was obvious to our underwater inspection that they must be buried much more deeply than the four we had already brought up and would require up to an additional week's work by the four principal divers to retrieve. We felt that the Australian Government would be glad to rescue these two buried cannons whose approximate locations we had marked, as well as the remaining ballast. Such was the case, and several weeks after we left the appropriately marked site, the Government commissioned Captain Vlasoff to retrieve the two remaining cannons, which he and his Government divers did most effectively.

Captain Cook jettisoned six cannons and many tons of iron and stone ballast, and six

cannons and many tons of iron and stone ballast have now been recovered and are in the hands of the Australian Government. The only item that could have been expected and was not found was the small bower anchor that Captain Cook inadvertently lost while trying to winch the *Endeavour* off the reef.

The recovered cannons and ballast of Captain Cook's monumental first voyage are being restored in Melbourne under the direction of Dr C. Pearson. The corrosion from

their 199 years in sea-water is superficial, and it is our understanding that the cannons will come through their restoration almost as good as new.

This we fervently hope, for these are authentic mementos of a superb explorer whose genius graced many nations in his discoveries. He was a man for all seasons and for all continents.

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MEET OUR CONTRIBUTORS . . .

J. H. CALABY is a Principal Research Scientist in the Division of Wildlife Research, CSIRO, Canberra. He studies the biology of members of the kangaroo family, and is also involved in fauna surveys. He is particularly interested in the natural history of Australia's native mammals and the effects of environmental changes on their distribution and abundance.

N. CARTER was born in Sydney in 1928, and educated at Scots College. His background on leaving school was mainly in the areas of advertising and marketing. In July, 1948, he joined the Citizens Military Forces, and, in 1951, volunteered for service in Korea with the Royal Australian Regiment. He was commissioned after completion of his Korean service and remained in the Army until 1956, when he re-entered the commercial world. Having a great interest in Australian history, he became Director of Captain Cook's Landing Place Museum in 1966.

R. O. CHALMERS has been the Australian Museum's Curator of Minerals and Rocks for the past 24 years. He has visited many mining fields and mineral deposits throughout Australia, and in recent years has closely studied the distribution and geological occurrence of australites in inland Australia. He is the author of a comprehensive book, *Australian Rocks, Minerals and Gemstones*.

H. J. de S. DISNEY has always been a keen naturalist and, as a schoolboy, went on expeditions to Finland and Newfoundland to collect birds for the British Museum (Natural History). He is a graduate of Cambridge University and, after serving in the RAF during the war, joined the Kaffrarian Museum in South Africa. Later he worked on economic problems as zoologist with the Department of Agriculture, Tanganyika (Tanzania), East Africa, first on cotton pests, then on birds, and finally on giant rats and otters. He became Curator of Birds at the Australian Museum in 1962.

D. J. MCGILLIVRAY is a botanist with the National Herbarium of New South Wales, Royal Botanic Gardens, Sydney. In 1959 he graduated in Science (Forestry) at the University of Sydney. He is at present the Australian Botanical Liaison Officer at the Royal Botanic Gardens, Kew, England.

J. V. S. MEGAW, born in England in 1934, was trained in archaeology at Edinburgh University, where he specialized in European Prehistory and Fine Art. He has had extensive excavation experience in Britain and on the Continent, and, since coming to Australia in 1961, has been carrying out a series of excavations in the south Sydney area aimed at establishing the full extent of the prehistory of the region. He is doing this work under the auspices of the Australian Institute of Aboriginal Studies, of which he is a member. Mr Megaw, at present Senior Lecturer in Archaeology at Sydney University, is a Fellow of the Society of Antiquaries of London, and a member of the Council of the Anthropological Society of New South Wales.

JAMES CHASE TYLER, aged 34, gained his B.Sc. degree at George Washington University, Washington, D.C., in 1957, and his Ph.D. degree at Stanford University in 1963. He is Associate Curator of the Department of Ichthyology and Herpetology, Academy of Natural Sciences of Philadelphia. He has participated in expeditions to the Gulf of Mexico, Antarctica, Brazil, the Bay of Bengal, the Seychelles Islands, and places in the Caribbean Sea.

PETER J. WHITEHEAD was born in Kenya and educated in England, taking a degree in natural sciences at Cambridge in 1953. He returned to Kenya to work on freshwater fish, especially river fish and the culture of *Tilapia* in ponds, from 1953 to 1960. Since 1961 he has been working on marine fish at the British Museum (Natural History). His principal field of research is the systematics of herrings and anchovies, but an interest in the historical aspects of ichthyology led him to work on the natural history of Capt. Cook's three voyages.

GILBERT P. WHITLEY is an Honorary Associate of the Australian Museum, where he was Curator of Fishes for 40 years before his retirement in 1964. He is a Life Member and a former Councillor of the Royal Australian Historical Society, and is the author of numerous articles bearing on the history of Australian zoology.

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