

The AUSTRALIAN MUSEUM MAGAZINE

Vol. V, No. 5.

JANUARY-MARCH, 1934.

Price—ONE SHILLING.



Banksian Cockatoo.

THE AUSTRALIAN MUSEUM

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THE AUSTRALIAN MUSEUM MAGAZINE

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■ OUR FRONT COVER. The Banksian Cockatoo (*Calyptorhynchus banksi* Latham) is by Lilian Medland. It is one of the series of postcards issued by the Australian Museum.

The Banksian Cockatoo was named after Sir Joseph Banks, who accompanied Cook upon his first voyage, and secured a specimen of this bird at Botany Bay. It is not so common in the coastal region as the Yellow-eared Black Cockatoo, but is generally distributed over the eastern half of Australia.

Black Cockatoos feed chiefly upon the wood-boring grubs of moths and beetles, which they obtain by tearing away bark and wood with their immensely powerful beaks. Except in the breeding season, they fly in small flocks of from six to ten or more, and utter a curious wailing cry. A single white egg is laid, in a hollow spout of a tall tree, usually at a great height.

Though Black Cockatoos can be kept in captivity, they do not make tractable pets like white varieties.



On the banks of the Daly River, North Australia. A Moil native fish-spearing.
(See page 163.) [Photo.—Charles Barrett.]



Published by the Australian Museum - - - - College Street, Sydney
 Editor: C. ANDERSON, M.A., D.Sc., C.M.Z.S. Annual Subscription, Post Free, 4/4

VOL. V, No. 5.

JANUARY-MARCH, 1934.

Tyrian Purple: An Ancient Industry

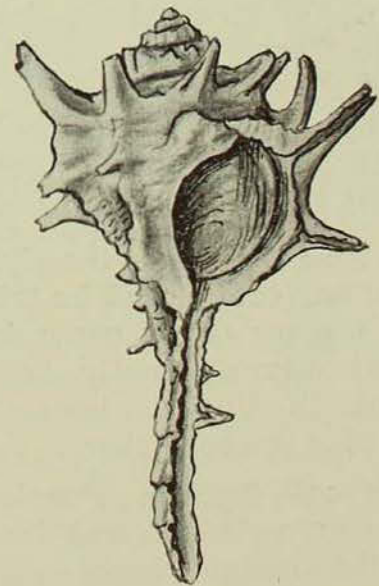
BY JOYCE K. ALLAN.

SINCE the time of the illustrious writers of olden days, much has been written concerning the famous Tyrian Purple, but, as in the case of many other arts, only fabulous tales now exist about its true origin. One of the best known is the story of Hercules, who was walking on the seashore with a beautiful nymph, of whom he was at that time enamoured, and his dog. The dog found a *Murex* shell, and after eating the animal, its mouth became stained with bright purple. So enthralled was the nymph with this wonderful colour that she persuaded Hercules to provide her with a gown of just that tone, and so arose the popularity of Tyrian Purple amongst the ancients.

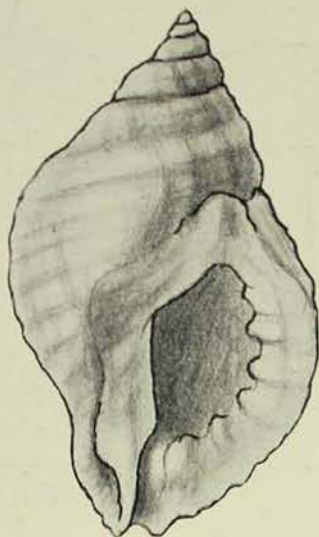
Though many believed that it was the Phœnicians who first discovered the art of purple-dyeing, it is now generally thought that the ancient inhabitants of the island of Crete in the Mediterranean not only knew of its existence, but followed up the industry long before the Phœnicians did. From evidence found

amongst the mounds of broken purple-shells there, this fact has now been practically established.

Most writers grant, however, that the Phœnicians, those remarkably industrious merchants, who in their commercial



From this species of *Murex* shell (*Murex brandaris*), and another species (*Murex trunculus*), the ancients obtained the greater part of the fluid necessary for their famous Tyrian dye.
 [Joyce K. Allan, del.]



Closely associated with the *Murex* shells in the purple dye industry was this small species of *Purpura* shell (*Purpura lapillus*).

[Joyce K. Allan, del.]

wanderings not only toured the whole of the Mediterranean and its surrounding seas, but reached even to the British Isles and the Baltic Sea, were responsible for the knowledge of the purple-dye becoming so well dispersed. They were the leaders of all manufacture amongst the ancients, and, as one of their chief commodities became Tyrian Purple, to the people with whom they traded the art became quickly known. Round the cities of Tyre and Sidon, their chief manufacturing centres, enormous mounds of broken purple-shells show what a tremendous industry it became to them, and, as their fame spread, the Phœnicians found it necessary to travel far and wide in search of fresh shells. In this way they established purple-shell fisheries in many places.

In the time of Pliny, the dye reached its highest perfection, and he tells us that the most famous of all came from Tyre. Later that city gradually became very unpleasant to live in because of the numbers of dye-works there.

The actual Tyrian Purple of the ancients was a fluid found in a certain gland in the animals of some spiral shells, known to them as Purples, but later to naturalists as species of *Murex* and *Purpura*, solid rock-living univalves, found between tides on rocky shores.

When it first emerged from the animal, contrary to expectations, the fluid was a thick cream coloured substance, but immediately on exposure to sunlight it passed through a series of bright yellow, green, bluish, and purplish red colours. This change of colour was always accompanied by an offensive smell, difficult to remove even from the dyed material, and this was supposed to be the reason why wearers of Tyrian Purple always used strong perfumes.

The fluid was given off by the animals when handled or disturbed, and was probably protective, like the ink of the cuttle-fish. To extract this, the early inhabitants of the Mediterranean picked the animal out of the larger shells by first breaking a hole in the side of the shell, and then removing the sac of fluid while the animal was still alive, or soon after death, before the quality became impaired. The smaller shells were pressed and pounded in cauldron-shaped holes in the rocks, and the fluid saved from them. The holes are still much in evidence round those places where the industry flourished.

Tyrian Purple was supposed to be the first colour applied permanently to wool and linen by man, and the easy manner in which it could be applied to these materials, simply by putting the fluid on the material and exposing it to light without any further process, helped considerably in the early adoption of it as a dye. Some simple methods of extraction were to press the operculum on the foot of the animal; the fluid flowed freely and the threads to be dyed were drawn



Most Sea-hares when handled exude a purple-coloured fluid. This small species (*Tethys norfolkensis*), found on kelp weeds along the coast of New South Wales, secretes a bright magenta fluid which seems to possess the same permanent quality as those used by the ancients.

[Joyce K. Allan, del.]

through it and then left to dry, the shell being placed back in the water to enable a fresh supply of fluid to form, or the animal was removed from the shell and squeezed with a knife until all the dye was collected. The same treatment of the threads was followed, and whole days and nights were spent in this tedious occupation. When washed in hot water and soap the colour came out brilliant and permanent.

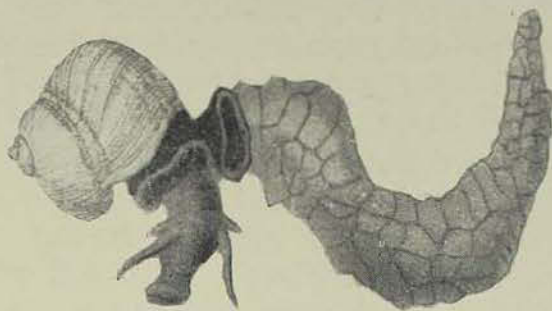
Though the simple method of dyeing material, mentioned above, was adopted by many, yet in the days of Pliny, when the purple-dye industry was at its height, a more complicated system, approaching nearer to the modern methods of dyeing, was employed. The fluid was allowed to soak in a quantity of salt for a few days. It was then diluted with about five times the amount of water and kept hot in a leaden or tin vessel for eight or ten days, and throughout this time the surface was skimmed for impurities which accumulated there. The wool, obtained usually from Greece, was first well washed and then plunged in this dye bath and left for some hours. Until the colour of the dye was considered satisfactory the liquid was kept very hot. The material was occasionally removed and put back again into the dye, until all the dye needed was absorbed.

The colour of the best dye was intensively permanent, and material has been known to retain all its brilliancy even after having been put away for over a hundred years. All the fluids were not purple, however, although they were of all shades approaching that colour. The true Tyrian dye, for instance, spoken of as Tyrian Purple, was really a rich red, but by dipping material into various coloured dyes obtained from different species of shells, other deeper tones resulted.

This process of double dyeing, which was practised by the Tyrians to a large extent, and which made their materials so famous, was at the same time very costly, and a pound weight of material

died this way was sold in the time of Augustus for over £36.

Although the Tyrian Purples varied in price according to quality and colour, they were considered by the ancient



When Violet Snails, delicate creatures which usually spend their life in the open sea, are driven ashore by gales, they often stain the sands with a violet fluid given off by the animals.

[After H. and A. Adams.]

Greeks and Romans as insignia of royalty or of official distinction exclusively. It was therefore reserved for special people and occasions, such as wearing apparel of men of high rank or honour, hangings in temples, and for robes of kings and priests. The Plebeians were not allowed to buy or use it in any way, and heavy penalties, including death, were inflicted on anyone wearing this colour who was ineligible to do so.

Though the colour was chiefly used in materials for the purposes mentioned above, yet it was occasionally employed in other ways. The sails on the vessels of ancient times were either dyed completely or bordered only with Tyrian Purple, the amount varying according to the rank of the owner. At the Battle of Actium, the sails in the ship of Antony and Cleopatra were entirely purple, while others were only partly so. Tyrian Purple was also used as a paint for the parchment of rare books, the letterings of which were in gold. The Roman women also used it as a rouge.

The art of purple-dyeing gradually came under the control of a chosen few. Having once been a great industry, it slowly died down until at the beginning of the twelfth century all knowledge of it round Tyre and Sidon was lost. Attempts were made at different times to

restore this industry, but, although a small amount of success attended these attempts, the introduction of aniline dyes definitely abolished any hopes of a complete revival.

Not only the inhabitants of the Mediterranean countries and Africa were conscious of the value of purple-dye. It has been found that while these ancient people were searching far and wide for fresh shells to meet the demand for this colour, the art of purple-dyeing was known and appreciated in other parts of the world. In very early times in the British Isles, purple dyes taken from shells were used, and as late as in the sixteenth to eighteenth centuries these fluids were employed for marking linens in parts of England, Scotland, Ireland, France, and Europe generally. To King Tigearnmas was given the honour of starting this industry in Ireland somewhere about 1,000 B.C., and enormous mounds of broken *Purpura* shells found there in recent times indicate how extensively they were used for this purpose.

The ancient Chinese were supposed to have a somewhat similar dye. They not only picked out the purple sac, but boiled and ate the animal, and finally polished the shell for ornamental purposes. The shell used was a purple snail found abundantly in islands round Batavia. They used the colour not only as a dye, but also as ink. As in other places, the large mounds of broken shells in Japan, of those species known to have a purple stain, showed that the Japanese also were aware in very ancient times of their staining properties.

It is assumed that the purple colour used in Central America from olden times as a dye, and even as late as the sixteenth to eighteenth centuries, was obtained from *Purpura* shells. These somewhat resembled the species used by the ancient Tyrian dyers, and were found plentifully on the rocks on the Atlantic and Pacific coasts of Central America and also the West Indies. The people of the New

World adopted the simple method of dyeing their materials, and this speaks well for the patience of those who occupied their days with this work.

Though *Murex* and *Purpura* shells were the two kinds known generally to be collected for their purple stain wherever this industry was practised, yet there are other molluscs which possess a purple or red fluid, and it is not improbable that some of these may have been also used in a lesser degree by the ancients.



Ladder Shells, which creep about in rock-pools or in deeper depths, give out a purple-coloured fluid if irritated. The species figured (*Epitonium australe*), which is found along the New South Wales coast, has often been found in the process of exuding this substance.

[Joyce K. Allan, del.]

Sea-hares have a most pronounced fluid, ranging in colour from bright magenta to deep violet. The stain from species of these could easily have been used by the ancients, and no record left to prove it, as, owing to their lack of any strong shelly structure, their soft bodies would easily perish. On the other hand, the fear the Greeks and Romans had of the fictitious poisonous qualities attributed to these animals may have prevented them handling them, even for the sake of the dye.

A purple fluid, secreted by the Violet Snails, very delicate gregarious shells found floating in large numbers on the surface of the deep oceans, is ejected by

the animals when disturbed. These snails are carnivorous and live on soft animals of the same violet colour. Attached to the foot of the Violet Snail is a float filled with air bubbles, and, if this becomes detached, the snail sinks. After strong gales hundreds of these shells are found driven in to shore, and the purple stain from them is most noticeable on the sand.

Somewhat closely allied to the Violet Snails are the Ladder Shells, which, instead of being gregarious, creep about in rock-pools or deeper depths, and give out a purple fluid if irritated. These are pure white shells with, usually, strong longitudinal ribs, and, as they are found throughout the world, it is possible that people in olden days knew them and their purple fluid.

Reviews

BUNYIPS AND BILLABONGS. By Charles Fenner, D.Sc., xvi + 241 pp., 1 plate and many illustrations in the text. Angus & Robertson Ltd., Sydney; 1933. Price 6s.

"Tellurian," over a period of many years, has contributed many articles of diverse interest to the *Australasian*. Here he has drawn a selection of these charming and instructive contributions together, so that those whose interest they once held may now have them in collected form. But they will now reach another circle of readers, which, it is certain, will be just as entertained and instructed as was that before it. The articles describe the curiosities of our fauna, the physiography of our continent, its prehistoric animals and plants, the coming of the black men, and myths and superstitions. That such diverse subjects as the Talgai man, the bunyip and the divining rod are dealt with, shows how general is the field covered by Dr. Charles Fenner.

The book is a worthy addition to those already published by Messrs. Angus & Robertson.

W.A.R.

BUDGERIGARS IN BUSH AND AVIARY. By Neville W. Cayley, F.R.Z.S., xviii + 148 pp., frontispiece, 6 coloured plates, 7 half-tones, 5 line drawings and plans. Angus & Robertson Ltd., Sydney; 1933. 7s. 6d.

In recent months one has become accustomed to seeing books on Australian birds by Mr. Neville W. Cayley; the one

under notice is the third. The author has spared no pains to make this volume as comprehensive as possible. To this end he has sifted much literature, utilizing the facilities of local libraries, that of this Museum included, to which one may further add the fact that the fine series of skins of colour varieties in the Museum's cabinet collection were also freely consulted.

Mr. Cayley has collected many interesting facts. He mentions that the illustrious John Gould introduced the budgerigar to England in 1840, that it was bred in Berlin in 1855, and that in Toulouse in 1888 a firm engaged in breeding them had no fewer than 15,000 birds at one time.

The author has not hesitated to supplement his own experiences with those of other aviculturists, and field observations of the bird by ornithologists are in plenty. The book is full of information upon housing, breeding, colour varieties and their production, and the ills to which the budgerigar is heir. It is enriched with coloured plates and half-tones, but its value would have been considerably enhanced had it been equipped with an index, a defect in a book of this type.

In his foreword Professor W. J. Dakin expresses the opinion that breeders will find much of interest in endeavouring to solve the puzzles and mechanism of heredity, and suggests that they may obtain facts of value to specialists. It is hoped that aviculturists will grant such co-operation readily.

W.A.R.



Cuddie Springs. The well, near which most of our excavations were made, is near the tree on the extreme right.

[Photo.—C. Anderson.]

The Cuddie Springs Bone Bed

By C. ANDERSON, M.A., D.Sc., AND H. O. FLETCHER.

AUSTRALIA'S PLEISTOCENE ANIMALS.

LIKE other countries, Australia had in the Pleistocene period, immediately preceding the era in which we are now living, a fauna, now largely extinct, which, while resembling present-day animals to some extent, yet differed in that some of the forms were larger than any now living. The bones of these creatures are found in superficial deposits in all parts of the continent, and are often revealed when heavy rain tears down the banks of flooded rivers and creeks, during well-sinking, or when mining operations are in progress. Remains of these animals are often found, too, in limestone caves such as those at Wellington, New South Wales, or the Mammoth Cave in Western Australia.

Unfortunately in many cases the skeletons are very fragmentary, as the bones have been separated and broken by stream action, and are no longer found in association, parts of skulls being recovered lacking the lower jaw, while fragments of limbs and isolated teeth are often encountered without any other signs of the long dead animals. Cave

specimens, too, are generally unsatisfactory, for, as the limestone becomes honey-combed with caverns at successively lower levels, the floors collapse, and the accumulated bones become broken and mixed in a most tantalizing manner. Only where the animals have been entombed and their carcasses left undisturbed can we hope to secure reasonably complete skeletons, from which an accurate picture of the living animals may be obtained.

One such occurrence of Australian fossil mammals is at Lake Callabonna, in Central Australia, where, in a salt lake or lagoon, many fine specimens were obtained over thirty years ago. In certain swamps in Tasmania, also, practically complete skeletons of the large extinct marsupial *Nototherium*¹ have been discovered. In New South Wales up to the present no deposit such as these has been found, and it was in the hope that at Cuddie Springs, near Brewarrina, more complete specimens would be found that in May, 1933, a party set out from the

¹ Scott: AUSTR. MUS. MAG., III, 1927, pp. 24-5.



The camp. This picture shows the level and sparsely timbered nature of the country.

[Photo.—G. C. Clutton.]

Australian Museum to make a thorough examination of this area and exploit its possibilities.

EARLY HISTORY.

The occurrence of bones of extinct animals at Cuddie Springs had long been known, in fact it is possible that the blacks knew of it before the advent of white men, and there is an aboriginal legend which professes to explain the phenomenon.

Long ago there was an immense gum tree, miles in height, which grew on the bank of the Geerah waterhole on the Barwon River, eleven miles north of Cuddie Springs. Near it was an aboriginal camp and in its branches a pair of huge eagles had built their nest, whither they used to carry the little black babies to feed their young. At last the blacks decided to get rid of these troublesome neighbours by cutting down the tree. When this was done the trunk was found to be hollow, and, in defiance of the laws of hydrostatics, the water ran along this huge pipe, emerging from the top end, where it fell at Cuddie Springs, the escaping water making a deep hollow in which were deposited the bones of the animals which had formed

the food of the eaglets. So, according to the legend, did Cuddie Springs come into being, and this is the origin of the bones found there.

The pioneer of this district was a Mr. Parnell, of Maitland, who settled here in the 'thirties, selling to Mr. John Dargan, of Bathurst, in the 'sixties, who in turn sold to Mr. John Yeomans in the early 'seventies. Subdivision has since taken place, but Yeomans Brothers, of Gilgoin Station, still hold Cuddie Springs and have always taken a keen interest in the fossils found there.

The spring itself was well known in the early days as the only source of water in a dry season between Marra Creek and the Macquarie and Barwon Rivers; it is probable, however, that the water was not of good quality, for it is understood that in the language of the Marra blacks "Cuddy" means bad. Not much is known of the tribe which inhabited the district in the early days, but the old hands say that they were a friendly people, who never gave any trouble, and who supplied most of the station labour required. Now and again the Marra blacks were raided by the Bogan River natives, a wild and poverty-stricken tribe of more war-like propensities.

FIRST DISCOVERY OF BONES.

In 1876 Mr. Yeomans put down a well at Cuddie Springs to a depth of about twenty-four feet, in the hope that the flow of water, which was falling off, would be increased. It was during the sinking of this well that fossil bones were first discovered here, and a small collection was forwarded to Sydney. These were examined by the Rev. W. B. Clarke, who asked permission to send some of the best specimens to Sir Richard Owen at the British Museum, London, which was done in 1877. Later some specimens were collected for the Department of Mines, Sydney, and a brief reference to the occurrence of the remains of extinct animals at Cuddie Springs was made by the late C. S. Wilkinson, Government Geologist.¹

WORK OF MUSEUM.

The Museum party, consisting of Dr. C. Anderson, and Messrs. H. O. Fletcher and G. C. Clutton, left Sydney by motor truck on 16th May last, and by the 21st had established camp near Cuddie Springs and commenced the work of excavation. The Springs are about fifty miles in a south-easterly direction from



This trench is about five feet deep. The bird bones were found in the foreground at a depth of about four feet.

[Photo.—G. C. Clutton.]

Brewarrina, and on the way we called at Gilgoi Station, where we were hospitably entertained by Mr. F. F. Yeomans, who gave us much useful information and advice. Here, too, we were fortunate in being able to enlist the services of Jack Sullivan, an accomplished camp cook, and of Jack Plowman, an experienced well-sinker. These two, and also Jack Hayes, who was later enrolled as a helper, gave splendid service throughout our stay, and their cheerful companionship and

¹ Wilkinson: *Proc. Linn. Soc. N.S.W.*, IX, 1884, p. 1239.



This pit has been sunk to a depth of about eight feet, where an agglomerate of bones and pebbles was found. Subsequently digging was continued here to a depth of fifteen feet.

[Photo.—G. C. Clutton.]

many humorous anecdotes did much to lighten our sometimes arduous labours. A half-caste, Jack Coombes, had promised to follow us to the Springs, but did not turn up, because, as we learned afterwards, his aboriginal blood revolted at the thought that we might possibly exhume the bones of some of his ancestors.

SCENE OF OPERATIONS.

Cuddie Springs is now a shallow depression or claypan, roughly circular in shape, and about 175 yards in diameter. It is situated in a vast plain in which the highest elevation is the bank of earth thrown up in constructing a dam or "tank" for stock, about a quarter of a mile from the Springs and near which our camp was pitched.

After heavy rain this depression is covered with water and becomes the resort of myriads of ducks and other waterfowl, but we had timed our visit to fall at a dry season, and were fortunate to find the Springs quite dry except for a small puddle near the centre, the result of a light rain which had fallen shortly before our arrival. The spring no longer discharges at the surface, as its source of supply seems to have been tapped by an artesian bore which was sunk in the neighbourhood to a depth of 1,000 feet over thirty years ago.

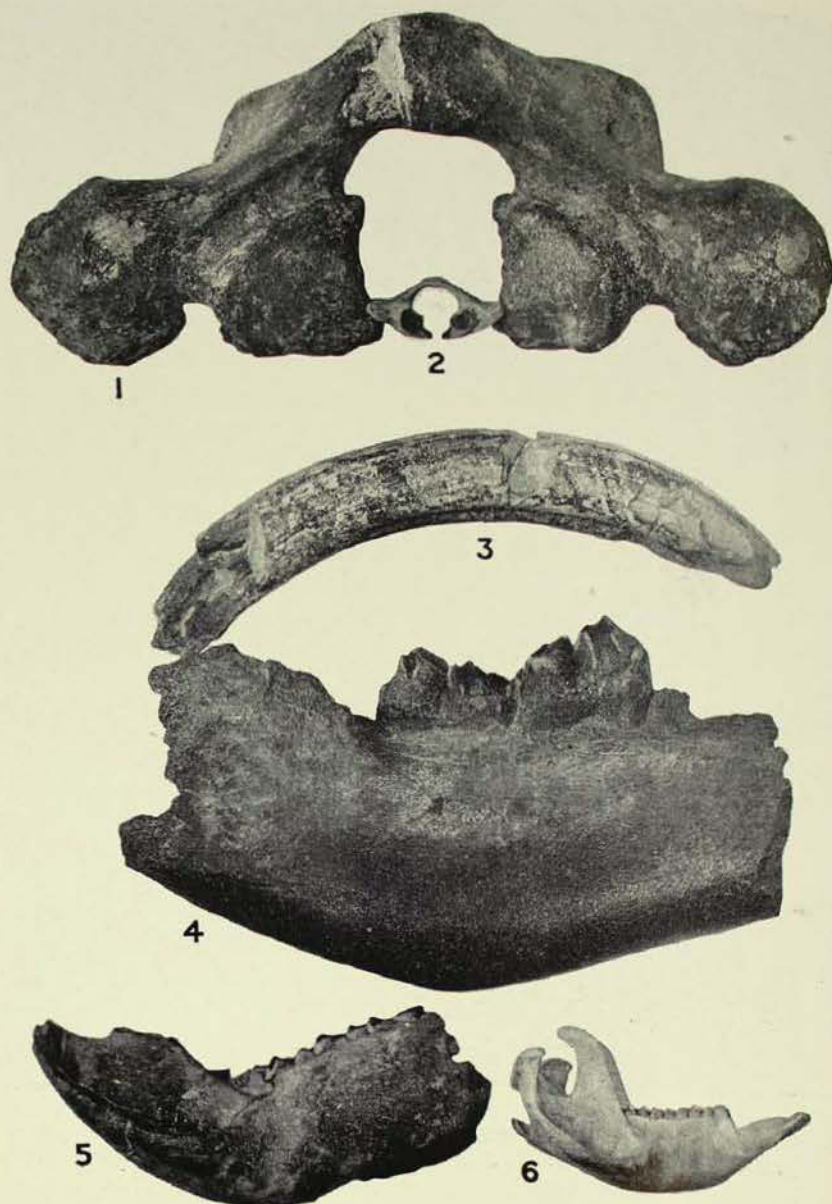
Although there is now no sign of it, there was apparently at one time a small creek running into the Springs, for Mr. F. F. Yeomans informed us that he remembered a gully on the northern margin. The depression must formerly have been

much deeper and also larger than it is at present, and has been filled up by clay and sand, which has been washed and blown in from the surrounding country, until now it is but little below the general level. It is almost bare of vegetation, no doubt as the result of repeated floodings. Near the timbered well at the centre is, however, a large acacia tree, and the country generally is sparsely timbered, the trees consisting mainly of box and belar, some of fair size.

We commenced our excavations about ten yards from the well, working towards the centre, and before work was stopped about five weeks later the claypan resembled the fields of Flanders, with a complicated series of trenches and pits, mostly about five feet in depth, but in one case fifteen feet. The surface layers down to a depth of about four feet were soft and wet, the clay exceedingly tenacious and troublesome, but once beyond the influence of the rain water, the ground was dry and compact, and we experienced no trouble with incoming water. At a depth of about two feet the first bone was discovered, but it soon revealed itself as the thighbone of a bullock. The skeletal remains of at least three bullocks and one horse were discovered, perhaps indicating the method by which the extinct animals were entombed. We can imagine a prolonged drought or a gradual diminution of the water supply of the district until only Cuddie Springs was left as a drinking place, where animals came to quench their thirst and were entrapped in the treacherous mud and clay of the water-hole.

SOME OF THE FINDS.

As sinking proceeded stray bones and teeth were discovered at intervals, but it



Some of the finds. 1 is the axis vertebra of the *Diprotodon*, with 2 the corresponding bone of the existing wombat for comparison. 3 is the upper front incisor of *Diprotodon*, and 4 part of its lower jaw. 5 is part of the lower jaw of the Giant Wombat *Phascolonus*, with 6 the lower jaw of the living wombat.

[Photo.—A. Musgrave.]

was not until a depth of about five feet was reached that we came upon fossil bones in any quantity. At this depth we found a layer of hard compact clay, somewhat resembling crumbling cement, and just below this was an agglomerate consisting of broken bones and pebbles, evidently an old land surface.

This was followed in the deepest excavation by five feet of biscuit-coloured and white clay with a few bones, which passed into a bluish clay with no sign of fossils until at a depth of about fifteen feet bones again appeared. This bluish

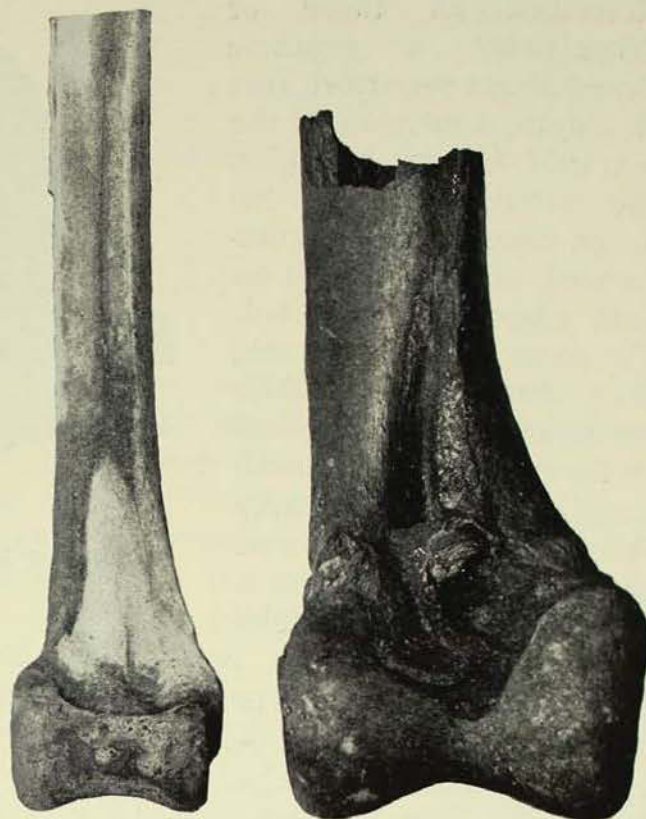
clay finally merged into a sandy layer, but no solid rock was found.

One of the first distinctive bones to be discovered was the first joint (atlas vertebra) of the neck of *Diprotodon*, an extinct marsupial larger than a rhinoceros and very massive in build.¹ This raised our hopes of finding the skull that in life was attached to this vertebra, but in this we were disappointed, although we found several parts of the skeleton of this gigantic marsupial, including part of the lower jaw with teeth, some complete leg bones, and one of its front upper incisor teeth, which, though broken at the base, measured twelve inches in length.

Another interesting marsupial of which we found jaw bones and teeth was the giant wombat *Phascolonus*, an animal about twice as large as any of its living relatives. Several bones of kangaroos, parts of jaws, teeth, and numerous leg bones were also found; some of these perhaps belonged to still existing forms, others to species now extinct.

A HUGE BIRD.

Of animals other than mammals the most striking find was the leg bones of a large extinct bird belonging to the family (Ratitæ) of flightless birds, of which the ostrich, the emu, and the cassowary are living representatives, and to which the extinct Moas of New Zealand also belonged. In these birds the thigh bone or femur is short and stout, and, as in other birds, is followed successively by two long bones of which the upper (tibio-tarsus) corresponds to the human shin-bone with the huckle bone (upper part of the ankle) welded to its lower end. The lower and shorter bone (tarso-metatarsus), which may be called the cannon bone, is really composed of three separate long bones fused together, but separated at the lower end to carry the toes; the lower part of the ankle is welded to the upper end of the tarso-metatarsus. Complete examples of the tarso-metatarsus were found, but only the lower



The shin bone (tibio-tarsus) of *Genyornis* (right) and corresponding bone of emu (left). The bony bridge spanning the groove at the lower end of the bone is absent in the emu.

[Photo.—A. Musgrave.]

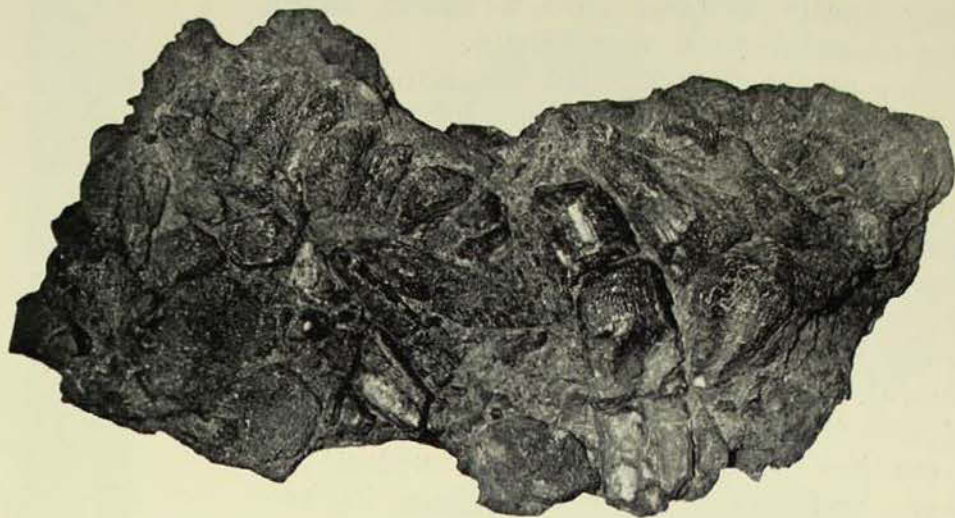
end of the tibio-tarsus. Fortunately this end is most informative. It shows a structure which throws considerable light on the affinities of the bird. In most flying birds (the parrots and hornbills are exceptions) there is at the lower end of the tibio-tarsus in front a small bridge of bone spanning a groove which in life was occupied by a strong tendon. This bridge is absent in all the living Ratite birds, but was well developed in the Moas. It was also present in a large extinct bird found at Lake Callabonna and named *Genyornis newtoni*. Examination of the leg bones of the Cuddie Springs bird leaves little doubt that it also was a *Genyornis* about twice as large as an emu.

REPTILIAN TEETH.

At various depths isolated reptilian teeth were found, but no other remains that could be definitely recognized as those of reptiles. The teeth discovered were of two kinds, one similar to those found at Rosella Downs, Queensland, and

¹ Anderson: AUSTR. MUS. MAG., II, 1924, pp. 113-116.

described as those of *Megalania*,¹ a gigantic lizard about seventeen feet in length, a member of the Varanid family, to which the existing goanna belongs. These teeth are compressed, slightly keeled on both edges, and serrated. The roots of similar teeth, also found at Cuddie Springs, were described by Owen. The other teeth found are larger, nearly circular in section and undoubtedly belong to a crocodile of large size. The



Block of bone fragments mixed with pebbles, from five foot level. About one-fourth natural size.

[Photo.—A. Musgrave.]

presence of these two formidable carnivores perhaps accounts partly for the dismembered condition of the skeletons found at Cuddie Springs, for no doubt they preyed on the carcasses of the unfortunate animals which came to grief at this waterhole.

RETROSPECT.

It is interesting but perhaps futile to conjecture what Cuddie Springs was like at the time when these extinct animals wandered round the neighbourhood, and what the circumstances were under which their remains found a resting place here. The presence of crocodiles indicates that the district was much better watered, and possibly Cuddie Springs was then the site of a large lake or inland sea into which one or more creeks

emptied. The agglomerate, consisting of broken bones and water-worn pebbles, some of fair size, found at the five-foot level, must be the product of running water of some velocity, from which we may infer that the landscape was once one of greater relief. Increasing aridity pressed hardly on the large herbivorous marsupials, and their decline reacted on the carnivores which depended on these for food. In the words of C. S. Wilkinson, "Nothing but want of water could have brought together such a heterogeneous assemblage of animals to the same drinking place; and what must have been their last terrible struggle for existence, as the supply of water failed, must be beyond description." This picture is, however, in all probability overdrawn, for Nature does not work in such a catastrophic manner as a rule, and the process of extinction was certainly a gradual one.

¹ Anderson: AUSTR. MUS. MAG., III, 1927, pp. 132-133.

When Mr. John Williams of *The Telegraph*, who had been visiting the East, returned recently, he presented to the Museum a most interesting collection of sea-slugs, sea-hares, shells and a Harlequin Reef Eel, which were collected on

the reef at Bali by Mr. Walter Spies. With the exception of the eel, these were unrepresented in the collections, and proved a very welcome addition both for their geographical range and for their species.

Australian Wood Moths

BY NANCY B. ADAMS,
Assistant, Entomological Department.

THERE are certain families of Australian moths whose larvæ burrow in the trunks of living trees, for which reason they are called Wood Moths. The first of these families, the Hepialidæ, whose members are popularly known as "Ghost Moths" or "Swifts", contains some of the largest and most beautiful, as well as the most destructive, of all moths. It is a very old family, and its members, whose primitive characteristics indicate their archaic origin, are found in greater numbers in Australia than any other part of the world.

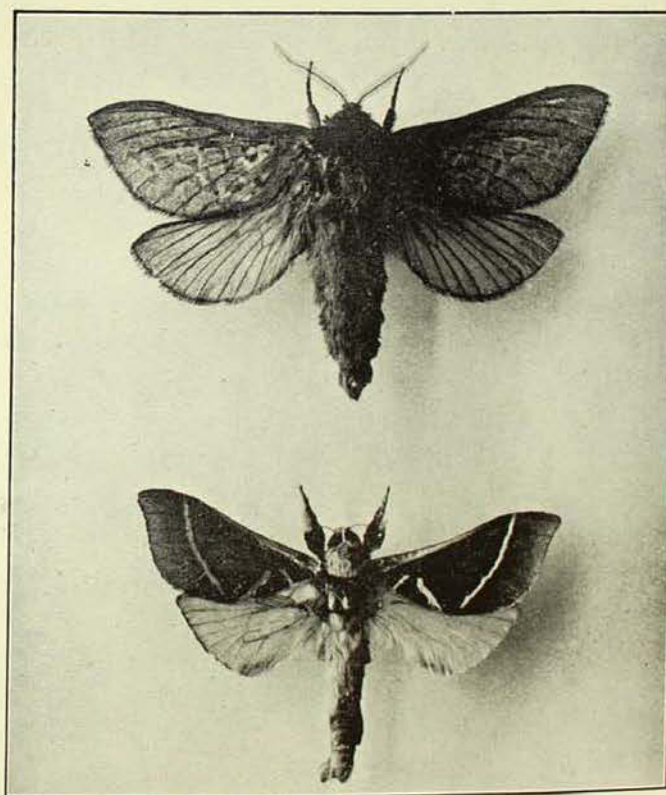
LIFE HISTORY.

The eggs, which are small and produced in large numbers, are often found in crevices in the bark of trees. From these eggs hatch soft and fleshy larvæ, the majority of which are borers in living trees. Many of them are of considerable economic importance, since they destroy annually much valuable timber. A few live in underground tunnels, from which they emerge at night and feed on grasses. The length of life of the larva varies and may occupy some years. When fully fed it becomes enclosed in a tough pupal covering and remains quiescent until the adult moth is ready to emerge. The perfect insect forms a striking contrast to the voracious larva, since it is incapable of feeding and so lives only a short time. Its useless mouth-parts are considered to be one of the primitive characteristics which mark the antiquity of the family.

THE SMALL GREEN WOOD MOTH.

The male of this species (*Charagia lignivora*) is a very beautiful little moth. It is smaller than most of its relations,

and its upper wings are pale green with silvery white markings. Its hind-wings are light grey and its body pale green and white. The female, which is a little larger than the male, has reddish-purple markings on its green fore-wings, while its body and hind-wings are orange red.



Above: The Dark Spotted Swift Moth
(*Oxycanus fuscomaculatus*).
Below: The Small Green Wood Moth
(*Charagia lignivora*).
[Photo.—A. Musgrave.]

These moths are found on various species of eucalypts and other native shrubs, and also on apple trees, orchardists in Victoria having suffered severe losses from the depredations of the larvæ. Enormous numbers of eggs are laid, but, fortunately, a host of tiny parasites attacks both these and the larvæ, so that comparatively few reach maturity. The larvæ

are long, slender, and yellowish-pink, with dark brown heads. They are very active and bore in towards the centre of the tree-trunk for a little way, then turn and burrow downwards for about two and a half inches. Each larva builds a protective covering of silk and wood-dust over the bark surrounding the entrance to its tunnel. This structure is often quite large and from the outside appears as a swelling on the tree-trunk. The larva emerges from its burrow and feeds on the bark under its little shelter. Pupation takes place just inside the tunnel, the head of the pupa being just level with the opening. The pupa is yellowish-white, with the head and first and second thoracic segments dark brown and horny. When the adult moth emerges, it crawls upwards and clings with its forelegs to the branches of the tree, hanging in this fashion till its wings are strong enough for flight.

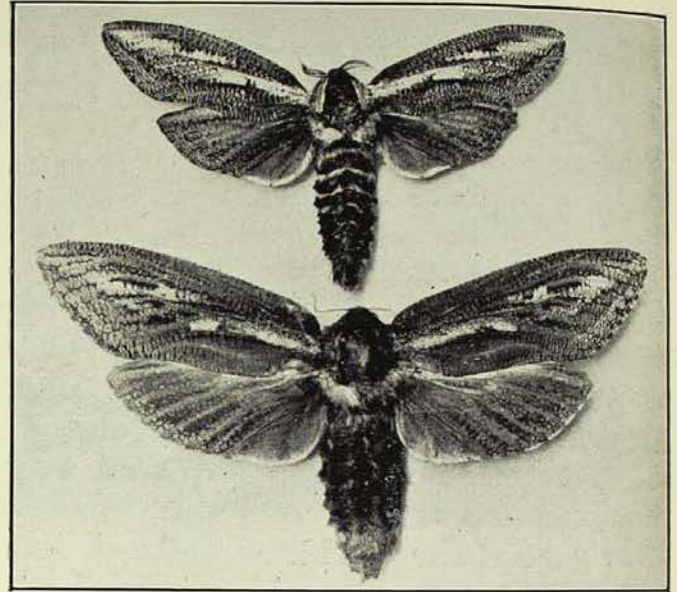
TRICTENA ARGENTATA.

In some parts of Australia a certain species of Ghost Moth, *Trictena argentata*, is considered a great delicacy by the aborigines. The larvæ apparently feed on the roots of the red gum (*Eucalyptus rostrata*). The moths are dull brown, their fore-wings greyish brown with silvery white and dark markings. They are attracted to light and fly into the blacks' camp fires, scorching their wings so they fall among the embers, and are forthwith devoured with much relish.

THE DARK-SPOTTED SWIFT MOTH.

In Victoria this species (*Oxycaenus fuscomaculatus*) is often seen in the early summer months fluttering around lights and fires. Its fore-wings are brown with dark spots and markings, and its hind-wings are brown, a little lighter than the rest of its body. This species, though it belongs to the family Hepialidæ, is not a Wood Moth, since the larva tunnels underground, particularly in loose damp soil, and feeds on grass roots. It is large, pale, and fleshy, and lives a long time, causing great quantities of grass

to wither and die. When fully fed the larva pupates in a vertical position with its head close to the surface of the ground, so that the perfect moth can push its way out easily. When the adult has emerged the empty pupal shell is often left protruding a little way from the mouth of the underground burrow.



The Wattle Goat Moth (*Xyleutes d'urvillei*). Above, male; below, female.
[Photo.—A. Musgrave.]

These moths fall an easy prey to owls and bats, while their larvæ are attacked by an extraordinary fungus growth known as *Cordyceps*. The spores of this fungus when they come in contact with the larvæ frequently take root in the soft tissues just behind the head and grow rapidly. The substance of the caterpillar is gradually absorbed and it dies. There are several species of this fungus, some of which may grow as high as eighteen inches above the ground. They are usually olive green and soft, but when dug out of the ground dry quickly, turning white and pithy.

The life history of the Bent Wing Swift Moth (*Leto staceyi*) has been described in a previous article by Mr. L. Gallard,¹ and an account of the literature connected with it has been given by Mr. A. Musgrave in the same number of the MAGAZINE.

¹ Gallard.—AUSTRALIAN MUSEUM MAGAZINE, iv, 12, Oct.-Dec., 1932, p. 408.



The Giant Wood Moth (*Xyleutes boisduvalii*). Larva, pupa, and adult female moth.
[Harriet Morgan, del.]

The most important of the remaining Australian Wood Moths belong to the family Cossidæ. One of the commonest of these is the Wattle Goat Moth (*Xyleutes d'urvillei*, known for some years as *Zeuzera eucalypti*), a large and beautiful creature whose larva is very destructive. The perfect insect has a furry brown body and greyish wings

mottled irregularly with black, white, and reddish brown. The marking and size are variable. The males, which as a rule measure about five inches across the outspread wings, are much smaller than the females and have very decorative feathery antennæ, while those of the females are bare and thread-like. The eggs are deposited in crevices in the

bark of various species of Wattle, usually *Acacia longifolia* and *Acacia decurrens*, and upon hatching the young larvæ commence to feed, boring head downwards into the woody trunk. Each larva is pinkish when newly hatched and changes to yellowish-white as it develops. It is provided with a pair of short horny jaws specially modified for rapidly chewing up the wood of the tree attacked. When fully grown the larvæ may be five or six inches long and are stout and fleshy. Since these larvæ may live for two or three years in the wood, enlarging their burrows as they grow, the number of valuable trees they destroy is enormous. If a tree is badly infested it will eventually die, or it may be so weakened that a high wind will blow it over.

When about to pupate the larva terminates its burrow close to the surface of the trunk, leaving a thin covering of bark over the opening. It spins a silken lining about eight inches long for the end of its tunnel and then changes into a dark brown pupa. In this stage it remains quiescent for some time. About January or February the pupa pushes off the covering of bark and, thrusting itself through the opening for about half an inch, splits to allow the adult moth to escape. The empty pupal shell is left in the burrow with the end just visible. When newly emerged the moths are not strong enough to fly, and while waiting for their wings to stiffen often fall an easy prey to ants. These vicious little

creatures collect in large numbers round the unfortunate victim and rapidly devour it while the helpless moth is still alive.

In some parts of Australia the larvæ are sought out and eaten by the aborigines.

THE GIANT WOOD MOTH.

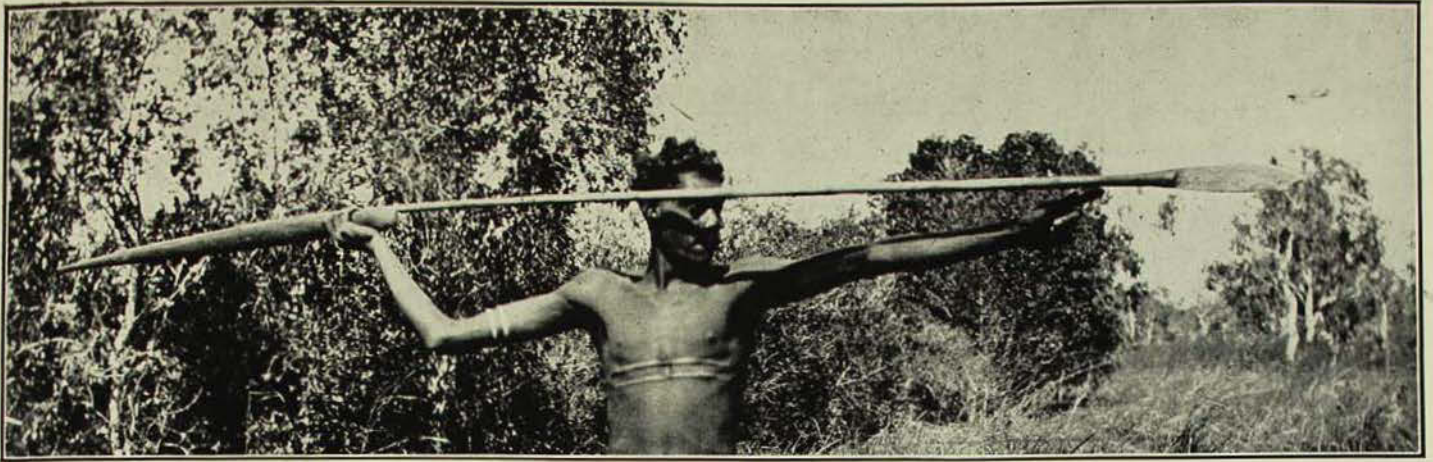
One of the largest members of this family is the Giant Wood Moth (*Xyleutes boisduvalli*). The female may measure as much as ten inches across the wings, though the male is much smaller. Both sexes are chocolate brown, but, with the exception of the hind-wings and sides of the body, are thickly covered with white scales and fluffy hair, which mask the ground colour and give the moth a greyish-brown appearance. The eggs are produced in countless numbers, but comparatively few reach maturity. The fleshy white larvæ burrow in the trunks of several kinds of eucalypts, destroying much valuable timber.

They are armed with powerful black jaws, and the prothorax and upper surface of each body segment bears a horny plate provided with tiny projections which help the active larvæ to move up and down their tunnels. Before pupating the larva tunnels to the surface and then blocks the entrance to its burrow with a wad of silk, which is later pushed out by the pupa. They have been known to live as long as four years before developing into the adult moth.

Dr. G. A. Waterhouse, a trustee of the Australian Museum, and Messrs. Max Day and Douglas F. Waterhouse, found recently a colony of rare slugs, *Onchidium chameleon*, on Gordon Creek, Lindfield Park, near Middle Harbour, a fine series of which they obtained and presented to the Museum. Previously only two specimens, obtained in 1918, were in the Museum's collection, so these additions are of considerable interest.

Mrs. M. E. Freame, of Glenferrie, Melbourne, has forwarded throughout the year interesting marine material to the Museum, some of which, including a small fish and some sea-slugs, have been found to be new species, and some new to the collections.

* * * * *
At the December meeting of the Board of Trustees of the Australian Museum Mr. F. E. Mance was re-elected President for 1934.



A Mulluk Mulluk (Daly River Tribe) shows how the Shovel-nose Spear is thrown.
[Photo.—Charles Barrett.]

Wild Nature in North Australia

BY CHARLES BARRETT, C.M.Z.S.

WE spent nearly three months in the "Northern Territory," my wife and I, travelling by motor car over hundreds of miles of bush track, and sometimes breaking a pioneer track through unsettled areas. Now and then we became "bushed," the car was "bogged" in flood silt or on black-soil plains, where, after heavy rain, motoring is like penance for one's sins. On the Sturt Plain, north of Newcastle Waters, we covered about twelve miles in three hours, then camped by the creek, where we had laboriously made a brushwood crossing. The trials of motoring in the Northern Territory are humorous in retrospect; "smile and forget" is good philosophy.

Ours was a roving commission, or, if you choose, holiday, with a purpose beyond that of mere touring through an unfamiliar region. Collecting was confined to plants and insects, spiders, small reptiles, land and fresh-water shells. We carried no firearms, and the only mammal captured was a rare little mouse, the victim of swift hand action as it darted from a hollow log. True, we went crocodile shooting, but played the part of observers for the man with the gun.

With the camera, however, we hunted all manner of "game," from aborigines to spiders. To ants we gave special

attention, and nearly 130 species were collected, including those taken in Central Australia and Western Queensland, and over a score are new species. Many of the spiders collected are rare or possibly new.

At Newcastle Waters, where we were delayed by a flood for more than a week, I spent hours daily searching for stone artifacts along the creek banks and adjacent flats, finding hundreds of scrapers, hammer-stones, a stone axe or two, many "reject" stone knives and spear heads, and a fine assortment of pirries. At Anthony's Lagoon on the return journey and in other places, we found great numbers of the stone implements used by the aborigines or by their ancestors.

Around Darwin there are fields for the bird man, for the botanist, for the specialist in almost any branch of natural history. Our rambles took us to the edge of the Adelaide River plains, where the buffalo hunters pursue their calling, to Casuarina Beach, where turtles' nests were found, to the famous colony of magnetic ant-hills, and to other localities.

GIANT ANT-HILLS.

These amazing examples of insect architecture have often been described. The group about ten miles from Darwin should be preserved as a tourist attraction;

they are on private property, but doubtless the owner would agree to a few acres being set aside as a reserve. Vandals have cut their names or initials into the walls of some of these ant-hills, but time and the repair work of the termites will soon obliterate these stupid scribblings.

Wherever we went in the Territory we saw ant-hills, varying in height from a foot or two to nearly twenty feet. There must be millions of these structures in this vast area, which someone has called the "Termite Territory," and they present a wonderful variety of form. The magnetic ant-hills, however, are uniform in structure, and can be recognized hundreds of yards away.

ON THE ROPER RIVER.

Red Lily Lagoon, on the Roper River, was a delightful surprise. Here we saw the sacred lotus (*Nelumbo mucifera*) or pink water-lily growing in profusion. It formed a barrier rising from black mud into which one sank to the knees, a screen for the host of geese and ducks on the waters of the lagoon. A blackfellow gathered the lotus for us, and in the blacks' camp near Elsey Station homestead we saw lubras preparing a meal from water-lily seeds and stems.

It was from a tangle of water plants at the ford below the homestead, on the Roper, that I gathered several kinds of shells, species which have not been recorded for many years, and all rare in collections, though common enough on the Roper River.

THE ABORIGINES.

From the Roper River we went to Mataranka Station, where I met old Nellie, one of the characters in Mrs. Gunn's delightful book *We of the Never Never*. She seemed pleased when asked to pose for her photograph. But down in the blacks' camp on the Waterhouse River my camera was not popular. Generally aborigines who live on the stations are obliging subjects; some of them have frequently been photographed, and a stick or two of tobacco makes them happy after posing. Once or twice I was asked for copies—"You bin sendum pictur



A remarkable ants' nest found by the author in Black Jungle, Koolpinyah. The ant is a new species.

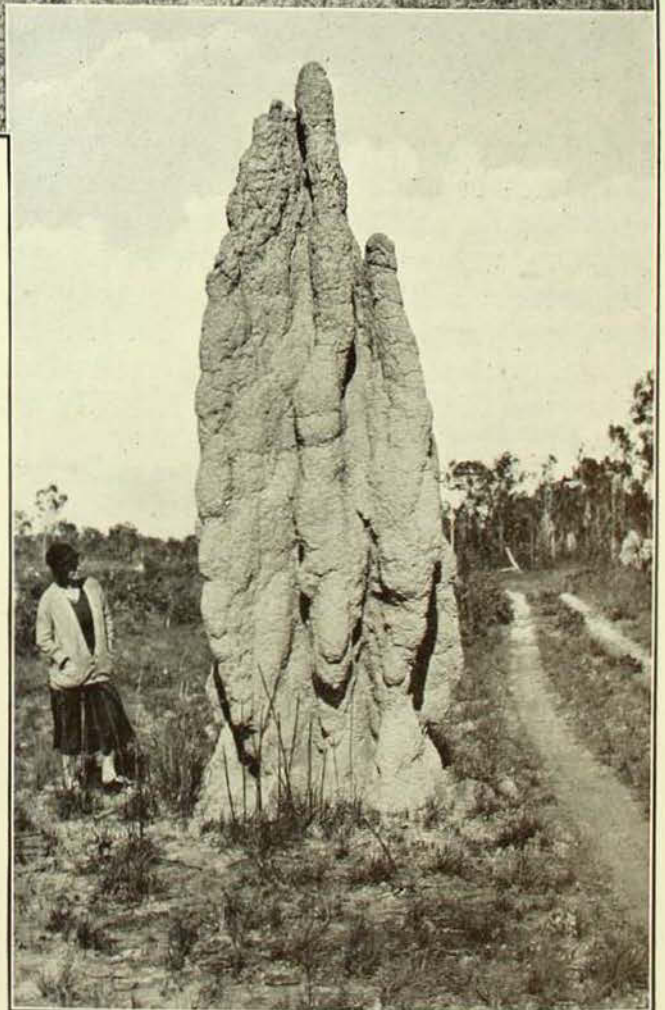
[Photo.—Charles Barrett.]

belonga me?" It surprised us to find a knowledge of English widespread among the aborigines, even far from centres of settlement. Many of the blacks on the Daly River spoke English better than we could speak the pidgin jargon, though the latter is generally useful.

In the Northern Territory I visited aboriginal camps on stations and elsewhere, and, though in one case I was warned that the "niggers" were dangerous, nearly all the blacks we met were friendly. Even those who plainly resented our presence were not hostile, and I never felt that we were in danger. Murders are occasionally committed by the blacks, but in nearly every case it is an act of wild justice brought on the victims by their own ill deeds. Of course, innocent men have been victims of aboriginal vengeance, and others have been killed for their



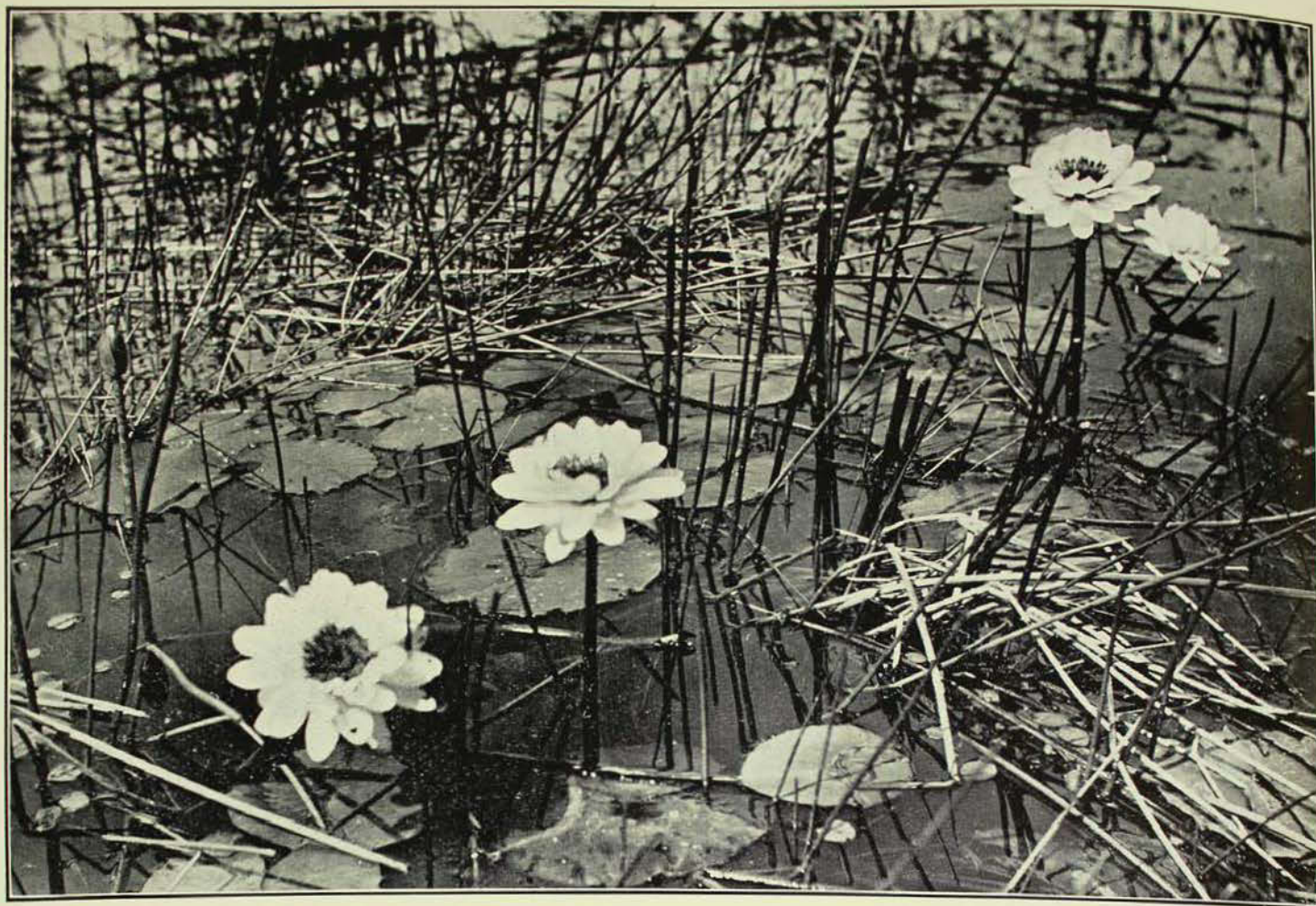
Above: Magnetic Ant Hills, North Australia.
 Right: The Overland Track, Birdum to Darwin.
 [Photos.—Charles Barrett.]



possessions, but such happenings are not unknown among civilized races.

Down on the Daly River we were in the country which for centuries has belonged to the Mulluk-Mulluks, a strip of settled land where many tribes are represented in the present population; among them are the Moil, Marithiel, Maranunggo and Nangiomeri. On this strip are peanut farms, where aborigines are employed for several months each year working for white and Chinese settlers. It is a curious sight to see aboriginal men, women, and children, squatting in groups, all but the toddlers grubbing for peanuts in the dry grey soil.

In a camp deep in the jungle on the west bank of the Daly River I was able to take photographs of aboriginal home life. An old man made fire by friction in the



Glimpses of a Lily Lagoon, North Australia.

[Photo.—Charles Barrett.]

age-old manner still in use where matches are scarce or unknown in the wildest parts of Australia and in some other countries. A young man showed me how to play the didgeridoo, a kind of trumpet made of a bamboo stem or a piped bough, and grinning warriors or hunters demonstrated spear-throwing. They were friendly and obliging folk.

CROCODILE HUNTING.

We went down the river in a small launch, mainly to see crocodiles, and we were not disappointed. Crocodiles are plentiful in the Daly River, and two that were shot from our launch each measured over fifteen feet in length. On the mud banks and sand spits crocodiles were seen basking; one big fellow was sound asleep, and the shot that wakened also killed him. The salt-water or sea-going crocodile of North Australia (*Crocodilus porosus*) is a dangerous brute; soon after our visit to the Daly River an aborigine was taken by one in mid-stream.

SCRUB FOWLS AND BUSTARDS.

On the western bank of the Daly River a mound of the Scrub Fowl (*Megapodius reinwardt*) was seen as we rounded a bend. To examine it I scrambled up the steep crumbling bank, after jumping from the launch across nearly two yards of black gluey mud. The mound was in a natural clearing, its outer wall close to the edge of the cliff. This was but one of numerous mounds observed in various parts of the Territory. In the jungle on Koolpinyah Station were some of the finest Scrub Fowl nurseries I have seen, more carefully shaped than usual, if not of huge size. The birds are abundant, though regarded as fair game; blacks rob the mounds, and many Scrub Fowls are, I believe, shot by whites.

The bustard or Plain Turkey (*Eupodotis australis*) also frequently falls a victim to the pot hunter, the visiting sportsman, and the blackfellow on the game trail. We met with numbers of bustards on our travels, singly, in twos and threes,



Blacks' Camp on the Roper River, North Australia.

[Photo.—Charles Barrett.]

or in small mobs. Nearly always they were easy marks, often standing for a minute or longer while the car came close to them. Shooting I had forbidden, but the driver looked hungrily at the turkeys and remarked that they were "good eating." There is need for stricter protection, and game hunters in the far north should be urged to concentrate on buffaloes and crocodiles and leave the birds alone. Of geese and ducks heavy toll will always be taken by settlers and visiting sportsmen. The flocks of Magpie Geese (*Anseranas semipalmata*) and some other kinds are so great that they are in no danger of becoming scarce for many years, but the bustard should be forbidden game to the white man.

BIRD LIFE.

Voyaging on the Daly one sees wonderful pictures of bird life. Perched on branches above the water are Eyton's Tree-ducks (*Dendrocygna eytoni*), egrets, herons, and Snake-necks or Darters. White-headed Shelducks or Burdekin Ducks (*Tadorna*

radjah) fly down stream, usually in pairs, sometimes in small parties.

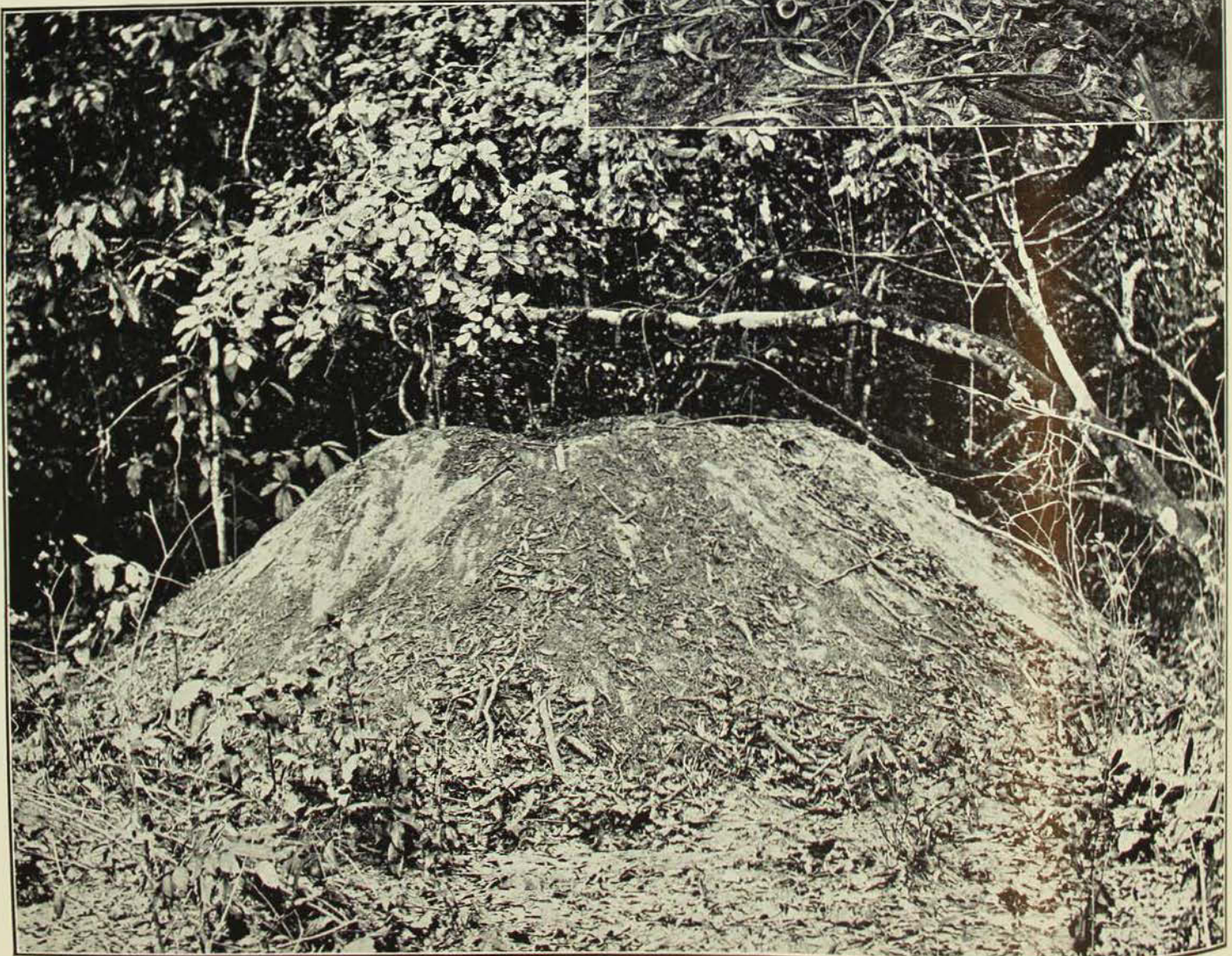
But all these are forgotten when one reaches the haunts of the Little Corellas (*Kakatoë sanguinea*), which perch in thousands on the jungle trees bordering the river. As the launch comes chugging towards them they rise like snowflakes blown skyward in a gale, to fly ahead screeching. For miles we had great flocks of these birds in sight; they would settle in a clump of trees, half a mile ahead, only to take wing again when we approached the noisy throng. A dozen times this happened, until the corellas tired of showing us the way, or decided that we were harmless. On the plains also, especially at bores on the Barkley Tableland, we met with Little Corellas.

Black Cockatoos (*Calyptorhynchus banksi*) were seen in flocks mostly, but also in pairs, in open forest country during the overland journey from Alice Springs and on some of our side excursions east and west of the Darwin-Birdum railway.

Formerly hundreds of these birds were shot annually, mainly by Chinese, who used their tail feathers to make fans. Happily fashion has changed, and now there is no demand for feather fans.

Often, motoring along bush tracks or rambling afoot among cycads, gum trees, and Pandanus palms, we heard the loud screeching of the lovely Crimson-wing Parrots (*Aprosmictus erythropterus*). Noisy also are the Red-collared Lorikeets (*Trichoglossus rubritorquis*), which in pairs and flocks climb among the blossoming eucalypts and other trees.

Right: Bower of the Great Bower Bird.
Beneath: Nest mound of the Scrub Fowl.
[Photos.—Charles Barrett.]



THE GREAT BOWER-BIRD.

A visitor to Darwin gardens is the Great Bower-bird (*Chlamydera nuchalis*), a species common in many parts of the Territory. Its bowers are easily found as a rule, and may be built a yard or two from the track or the railway line. Some we noticed were in islets of scrub, others partly hidden by fallen branches. One on the Daly River was in a grove of Casuarinas, near a dry creek marked by dense thickets of bamboo. Many creeks in the Territory are walled with bamboos along portion of their course, and there are river-side bamboo jungles as well.

The Great Bower-bird's fancy is for shells, and it is a sharp-eyed and diligent collector, for hundreds of shells may be heaped at one of its play-grounds: near the coast pieces of coral will be amongst the decorations. On the way to Koolpinyah Station we examined a bower near the track which was arched, as it were, by the trunk of a fallen tree supported by its branches. Around the spot were straggling bushes. This bower was a new one, built near the ruins of a play-hall destroyed by fire after having been in use for several years. The long grass is burnt off annually in many parts of the Territory, and many bowers must be destroyed, as well as innumerable nests of birds that build among the grass or close to the ground. It is strange to a southerner to see grass fires deliberately started: often we motored through tracts of country with fires raging on both sides, and in some places across the track. Where the grass has not been fired for a year or two it is as tall as a man, and almost impenetrable. Trail breaking through the long grass is exhausting work.

LIZARDS.

Among the lizards we collected are some rarities. Close to Darwin I captured a beautiful little snake-lizard (*Delma* sp.), which the blacks feared, declaring that it was "cheeky fellow" (poisonous). But the most interesting of all the reptiles

seen was collected by a resident of Darwin, who would not part with the treasure. It was a species of *Draco*, or flying lizard. When I saw the specimen in a store-box, among stick-insects, butterflies, spiders, and scorpions, I could hardly believe that it was collected in the Territory. No *Draco* has been recorded for Australia, its home being Malaya and the Dutch East Indies, but the owner of the curio collection assured me that she had seen many of these lizards, and had captured two out near the salt-pans, a few miles from Darwin. So I spent a morning at the locality searching for *Draco*, but none were seen. However, a Greek at the salt works, when given a description of the "winged" lizard, said that he had often observed it. I wonder!

RUMOURS AND REALITY.

An aborigine told me that he had seen a monkey on the Daly River, and his description proved that he had actually met with a small monkey—but it was a missionary's escaped pet. A Darwin naturalist told me how the persistent rumours of wild monkeys existing in northern jungles originated. A missionary had a monkey which came from Ceylon or Malaya. The animal was taken by its owner to the old mission station, long since deserted, on the Daly River, where it was seen by many of the aborigines.

There is some reason to believe that a large tiger-cat, unknown to science, exists in the Northern Territory. A station owner who is not disposed to credit bushmen's yarns of strange animals, considers that there is truth in the wild cat story. He hopes sooner or later to send me word of the discovery of a large marsupial cat hitherto unknown to naturalists. One of his blacks has had glimpses of a striped tiger-cat nearly as big as a half-grown dingo. It is noteworthy that more than once tales have been told of the existence in Northern Queensland of a large marsupial cat or "tiger," but no specimens have ever been obtained.

The Mighty Polyp

By FRANK A. McNEILL.

OCCUPYING a justly earned position of prominence in the cosmos is the delicate flower-like animal builder of the millions of acres of limy beds occurring in all warm seas. These reefs of coral which it has created have been increasing almost since time began, and the polyp responsible for their construction has surely earned a place among the mighty. Indelibly written in the pages of history are records of the terrors the reefs bore for the sailormen who explored uncharted seas. Think of the untold shipwrecks caused by the coral and the consequent loss of numberless human lives! Even today naval surveys are still being conducted in order better to understand the intricate mazes and channels which are so peculiarly a character of coral seas. Singularly enough, Australia boasts the world's greatest compact coral structure in the form of the Great Barrier Reef. This endless maze of reef is one of the wonders of our age. It stretches for more than a thousand miles along the coast of Queensland, and occupies an area of approximately 80,000 square miles. Because of this, and also for the reason of the prominent part the Great Barrier is destined to play in our future development, it is appropriate that something should be understood about the animal responsible for its construction.

Year in and year out, over the whole twenty-four hours of each day, the coral polyp feeds and works. Slowly but surely it accumulates around its soft body the skeleton of carbonate of lime extracted from the waters of the sea. Whether it be the solitary enlarged occupant of a simple coral growth or a minute unit of a colonial branching form, each polyp carries on its own separate task, leading a life independent of its fellows. That such animals, so lowly in organization,

could be responsible for the immense reef structures, is little short of incredible.

Upon the critical examination of a polyp something of its simplicity is readily gleaned. In the great section (Actinozoa) of the animal kingdom to which the corals belong, the polyp is a universal feature. So primitive is the construction that it is little more than a sac of delicate flesh, with the opening surrounded by a ring of tentacles. The opening is the mouth of the polyp, and the cavity into which it leads represents the most simple form of stomach known to science. Under the circumstances feeding is reduced to the simple process of taking food into the body by the same aperture through which the discard is expelled. Supporting the flesh are thin upright walls of lime termed septa, and these are always arranged in a radial manner. A close scrutiny of even the most minute pores in the substance of a piece of coral skeleton will always reveal the gossamer-like limy walls which in life supported the tiny polyp occupants.

Unlike the coral polyps, the closely related sea anemones so common on our shores lack supporting skeletons of lime. For this reason an anemone is easy to dissect, and being a polyp normally larger than its coral cousin, it provides a good example whereby the few simple features of the latter may be clearly seen and understood. Carefully remove one of these animals from its anchorage in a rock pool with the blade of a knife, and with the same instrument slit the body in two along its long axis. With the internals thus revealed, the mouth is seen to connect from its opening in the centre of the mass of tentacles with a short tube or gullet which projects downwards into the stomach. Next to be noticed are the

numerous, thin and closely packed upright partitions of flesh, termed mesenteries. These serve to divide the stomach into separate compartments, and so increase the area of absorption. In the coral polyp similar partitions correspond with, and are supported by, the thin walls of lime previously referred to. A careful scrutiny again of the dissected anemone will disclose that certain mesenteries come right across from the inside walls to unite with the gullet above, or almost meet one another where their edges are free below it. Others come only half-way to the centre of the stomach cavity. A third kind again may be so short that they are hardly more than wrinkles on the inner stomach walls. It is on the sides of those parts of the largest or primary mesenteries which lie free below the gullet that little swellings appear which later develop into the sex products called gonads.

Sometimes the developed gonads are clearly visible in the bodies of large sea anemones.

Although a single coral polyp is capable of developing both male and female elements, it seems to be generally accepted that these do not appear at one and the same time. Hence it happens that the polyps containing male elements extrude them into the sea at certain times of the year in the form of a fine, milky fluid. Fertilization takes place when these are drawn into the bodies of egg-bearing polyps. Then is developed from the eggs the little balls of tissue which are finally freed into the surrounding water as planulae. In the correct season, planulae are produced in vast numbers by the corals. Specimens that have been required for experiment by biologists have been secured by placing particular kinds of coral in buckets of sea water.



In branching corals the limy skeleton houses colonies of often tiny polyps. Like the single giant polyp which occupies the skeleton of a solitary coral, each is a separate unit, carrying on its own life processes despite the delicate thread of integument which joins it to its neighbours and makes them all of the one flesh.

[Courtesy of Bank Notes.]

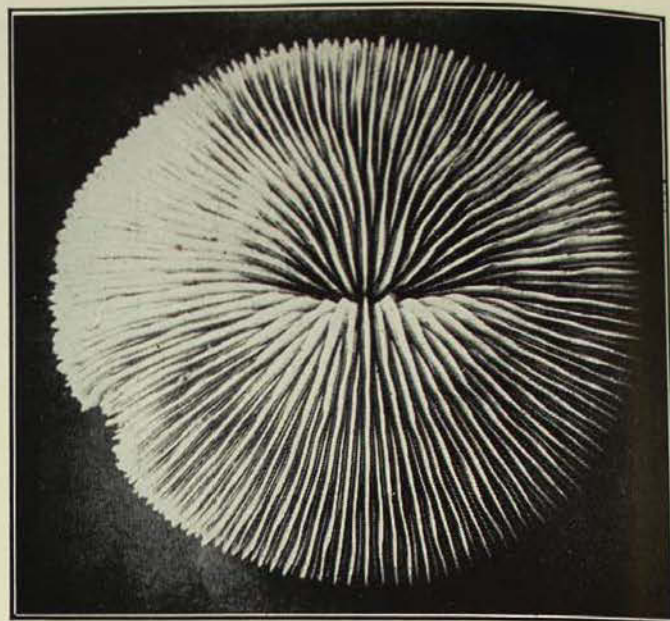
When after a short time the planulae would appear at the surface in hundreds and thousands, they have been carefully drawn off for microscopic examination with special dipping tubes called pipettes.

The newly released planulae quickly develop a mouth at one end and also a central cavity or stomach. Active locomotion is effected by the continuous movement of coverings of minute hairs, which serve to keep the larvæ within the influence of currents near the surface. Very soon now these minutiae must settle on the bottom in order further to advance in their metamorphosis. Death is only avoided when they chance upon a clean, hard surface which offers secure anchorage. The accelerated and complete change which then takes place involves the spreading out of the base and the production of lime to aid the cementing operations. Meantime there

appear within the tissues the beginnings of the skeleton, soon to become apparent through the semi-transparent flesh as the first upright limy walls or septa of a tiny coral polyp. The final growth of a ring of tentacles around the mouth aperture makes the resemblance complete. Viewed under a low power of the microscope, the young polyp is at this stage a minute cup coral of exquisite grace.

In branching corals like the common Staghorn varieties one polyp assumes the lead in any of the upward or outward growing branches of a colony, and buds off smaller polyps on all sides of it. Meantime a thicker and thicker layer of limestone is being built up beneath and around them. This deposition of lime is most advanced in all of the massive, compact types such as Brain Coral, but in these the polyps multiply by a definite process of division. Upon an individual attaining a certain size it begins to elongate until a slit appears in the centre of the upper surface or disc. Soon two mouths appear where formerly there was only one, and each becomes surrounded by a separate set of tentacles. The next move is the laying down of limestone between the two newly-formed bodies, until finally there are developed two complete polyps instead of one. These now lead an independent existence in all the major functions of life. The only connection retained one with the other is a delicate thread of integument at the base. This condition is characteristic of colonial coral growths, thus rendering their component polyps all of the one flesh.

Unfortunately it is mostly during the hours of darkness that corals expand their brightly-hued polyps. When numbers of them are closely assembled in a coral they appear as a rich garden of tiny flowers with gently waving petals. Adding to their lustre is the often soft glow of a phosphorescent property, which sometimes renders them visible in the darkness. In spite of a beautiful appearance, however, corals are carnivorous animals, and to approach too near them spells death to the minute floating life of the sea. The little



The limy skeleton of a simple or solitary coral, sometimes called mushroom coral. The structure is occupied by a single giant polyp, and the upright walls or septa which support the animal can be clearly seen. These septa are characteristic of all coral polyps.

[Photo.—G. C. Clutton.]

tentacles, which are moved with such grace by the polyps, house batteries of very minute but deadly weapons known as nettle-cells. Though microscopic in size, the nettle-cells are most elaborate in structure. Each consists of an oval-shaped sac, within which lies the finest of coiled springs bathed in a poisonous fluid. Each spring is released as a long, barbed thread when any tiny animal inadvertently brushes against its microscopic hair-trigger, which projects from the surface of the tentacle. The poison carried causes instant paralysis of the prey. As every tentacle of a polyp possesses many thousands of nettle-cells, it constitutes a deadly weapon in the world of the tiny animalculæ of the sea.

When prey has been secured by the tentacles of a polyp, it is usually conveyed by them to the mouth opening. In the few corals, however, which have very small tentacles, the kill is carried to the mouth by currents induced by the beating of fine hairs or cilia. These cover the closely packed polyps on the surface of coral colonies and normally serve as cleansing organs, quickly removing any sand, mud or other fragments which settle on the growths. Failing such a provision gradual silting and final suffocation would result.



Panoramic view from the summit of Mt. Gibraltar (Donkin). The Lansdowne Valley, 2,600 feet below, is seen to the immediate left of the centre. Extending to the left, in the middle distance, are the volcanic ridge Camelback and the small volcanic peaks Oliver and Kennedy. To the right are the large volcanic peaks Baldy, Coxcomb, and Goonook.

[Photo.—R. O. Chalmers.]

The Mid-North Coast

BY R. O. CHALMERS, A.S.T.C.

INTRODUCTION.

TOWARDS the end of last January a trip, accomplished on foot for the most part, was made by the writer, accompanied by Mr. A. W. Boleyn, of Sydney. Wingham, some 200 miles distant from Sydney on the North Coast Line, was fixed as the starting point, and the time taken on the trip was five days, while the distance covered was about ninety miles. It was intended to visit both the Bulga and the Comboyne, two basalt-capped plateaux each having an elevation of some 2,500 feet and situated on the range to the west of Wingham. The principal village on the Bulga is known as Elands, and that on the Comboyne bears the same name as the plateau. Each of these little settlements is twenty-five miles distant from Wingham and about sixteen miles distant from each other in a general north-east south-west line. The Bulga tableland is more dissected by mountain streams than the Comboyne, hence there is less basalt, and correspondingly less incentive for settlers to commence farming. Thus the

latter has been civilized, shall we say by far the longer of the two.

This range is a south-eastern extension of the Guyra Plain level of the great New England plateau. Mr. E. C. Andrews, B.A., a Trustee of this Museum, and formerly Government Geologist, has divided New England into four areas of different altitudes. The Guyra Plain is one of them, and is 4,000 feet high in parts and generally basalt-capped.

THE BULGA.

The names scattered at five-mile intervals along the road map are very deceptive. One imagined that the name would indicate the presence of a hotel, a store, a church and other essentials of a country village, but as far as we could see, there were neither houses nor people. A horseman was stopped five miles from Wingham and asked if he thought that Ashleaf was in the vicinity. His opinion was that we were passing through it, and so we were, but there was nothing to indicate where we should stop. Similarly, when due at a place called Marlee we were the proud

recipients of a lift in a haggard old car with a bedstead-like chassis. The driver, on being asked where the town was, replied by vaguely waving his hand over some hundred acres of good pasturage, green enough, but uninhabited.

Bobin Creek (where there was a store) was the furthest point reached that night, and from there to Elands was only nine miles, but in the last three miles, if the road were followed, it was necessary for us to rise about 2,000 feet. There was a cattle track, however, which would enable us, so we heard, to do the ascent in one and a half miles, so that early next morning we decided to take the short cut, and commenced climbing in the timber country. The low-lying dairy farms were being left below on the plain, and the big eucalypts were stretching higher and higher to the top. Far below were caught glimpses of the fern-fringed road winding up to Elands by a much easier grade.

Some big Brush Box trees and Tallowwoods were seen amongst many other trees. The Brush Box (*Tristania conferta*) is difficult to season, but is useful for the massive timbers required in the making of wharves and bridges. The Tallowwood (*Eucalyptus microcorys*) continues to exude a natural oil after seasoning, and is in great demand for the making of expensive ball-room flooring.

When we reached Elands at the top the good provincial folk, almost without exception, regarded us with suspicion, for we were dressed more for coolness and comfort than for elegance. We did not stay, but passed straight through on the way to our next stopping place, Ellenborough Falls, some four miles west of Elands. It was along this road that we saw the famous North Coast brush forests, the first noticed since leaving Wingham on the fertile flood plain of the Manning. The luxuriant vegetation on the mountains is evidently supported by the rich weathered basalt soil. The road we followed was somewhere near the irregular margin of the basalt capping, for quite suddenly, in two or three places, the brush was replaced by the ordinary and much scantier eucalypt scrub, the presence of which showed the basalt to



Ellenborough Falls, as the river takes a plunge to resume its course 500 feet below. The gorge can be seen trending northwards to where it will eventually join the Hastings River.

[Photo.—R. O. Chalmers.]

be absent and poorer soil to have taken its place. Then just as suddenly as it had disappeared, the brush forest would come into its own again. It made a very impressive border to the road, tall straight limbs with dense foliage and dark-green undergrowth. Bird-nest palms, stag-horns and elkhorns were plentiful, together with the sinuous lawyer vine winding round trunks or hanging down from a great height.

ELLENBOROUGH FALLS.

The Falls themselves lie a quarter of a mile to the north of the road, and as the Ellenborough River crosses the road it appears a very placid little stream flowing in a north-south direction. How-

ever, it suddenly encounters a massive series of very resistant rock composed of closely cemented angular fragments of slate, quartz and other things, and known as a tuff. The river immediately makes a right-angled bend, becomes a seething course of rapids for about six hundred yards and plunges over the edge of a gorge running north and south, thus resuming the original direction of its course at the bottom, some five hundred feet below. It is a tributary of the Hastings, and was named by Oxley in 1818. Since only four hours were spent at the Falls in daylight, there was not time enough to ascertain the reason for the two right-angled bends in the course of the river. The rock itself is very compact and resistant to the agents of atmospheric weathering, so that the walls of the gorge are quite perpendicular. Magnificent as the scene was by day, at night it became magical. The quiet sunset afterglow was straightway replaced by the light of the waxing moon rising early. Slowly in the quiet dusk it climbed the high eastern wall of the gorge until the Falls became as a band of silver, with vague margins changing imperceptibly into a misty spray which continually rose from below.

THE COMBOYNE.

On the next morning a return was made to Elands. From here a bridle track runs for thirteen miles in a north-easterly direction along the ridge, to be replaced by a road which covers the remaining ten or eleven miles into the town of Comboyne itself. From there it continues down to Wauchope on the Hastings. A scattered house here and there marks the winding track, and at every one we met with unbounded hospitality. All the way through this country the brush forest is



"Reflets dans l'eau." The sleepy little town of Tinonee mirrored in the still waters of the Manning, some four miles from Taree.
[Photo.—R. O. Chalmers.]

never absent for long. Here it was even more luxuriant than on the Ellenborough Falls road. Some of the trees were sombre giants as they stood passive, bound to the earth by lawyer vines, some of which were so big that they could not be spanned by the two hands. Whereas along the brush-fringed road a sense of the open was conveyed by an unhindered view of the sky, here was an enclosed space of great quiet. The overhanging foliage allowed only broken and filtered sunshine to pass through, which gave a strongly contrasted light and shade effect on the thick carpeting of green fern. This, together with the uniformity, but never monotony, of predominant greens and greys, gave a strong impression of well-ordered design.

The serpent in this Eden was represented by the "Giant Nettle Tree." This is not very tall, with broad green leaves covered with a profusion of fine hair-like processes. Through these the stinging fluid is delivered if one is curious enough to touch the leaf, and the sting of a nettle is supposed to be a pleasurable sensation in comparison. The tree is called *Laportea gigas* by the botanist, and Goo-mao-mah by the aboriginal. In passing, one can safely say that a name far more resonant than either of the former, and fraught with greater significance would have been applied to it by the first white Australian

bullock-driver on the North Coast to be stung.

In contrast to the intimate atmosphere of these green places one would come unexpectedly to a high part of the ridge and see to the west a grand stretch of deep gorges extending further and further into the rugged south-eastern margin of the New England plateau. Some five miles before

the village Comboyne, just where the Wingham road branches off, there is a superb vantage point. This stands out on the ridge as a sharp peak, and is formed by an outcrop of trachytic rock. A trigonometrical station has been established on it, and it is known either as Mount Donkin or Gibraltar. From the top the extent of the view makes even Sublime Point and Cambewarra seem insignificant. The sea is at least thirty-five miles distant to the east. In the far middle distance can be seen Wingham, Taree, and Cundle, while the Manning flows past them on its way to the sea. In the far south are the mountains of the Mount Royal Range, near Gloucester. On a clear day Cape Hawke can be seen to the south-east, and, although the northern view is somewhat blocked by outstanding parts of the ridge, glimpses of the country in the vicinity of Kempsey are to be caught. A photograph was taken from the top of Mount Gibraltar, and in the foreground are some conical hills standing, for no apparent reason, on the otherwise flat coastal plain. These are the alkaline intrusions of Lansdowne, and consist of trachytic rocks, which are characterized by a high percentage of the alkalis, soda and potash. These rocks occur at a few localized centres throughout New South Wales such as the Canobolas, the Warrumbungles and the Nandewars and, according to Mr. C. A. Sussmilch, F.G.S., seem to have been intruded along lines of weakness in the earth's crust, which



The lagoon at the mouth of Khappinghat (Saltwater) Creek some ten miles south-east of Taree. This is a typical small coastal lagoon with the entrance at the northern end.

[Photo.—R. O. Chalmers.]

afterwards became lines of folding and faulting. Certainly in this locality the steep scarp of the Comboyne rises immediately to the west of Lansdowne and is considered a monoclinical fold similar to the scarp of the Blue Mountains at Glenbrook. Furthermore, it is possible that Mount Gibraltar is an intrusion similar to those at Lansdowne, and thus we have evidence that first came the intrusions, then the folding which elevated the Comboyne plateau to its present level 2,000 feet above the coastal plain. Only, whereas the Lansdowne intrusions were left below, the Mount Gibraltar intrusion was elevated.

SALTWATER.

A return was made to Wingham and, from Taree this time, a journey to the coast, some ten miles to the east, was undertaken. Here it might be said that since I am trying to introduce more geology than is usual in a popular travel article, it will not be out of place if I tell of the small amount of entomological collecting that I did. I regret to say that I omitted to take collecting gear to the mountains, but a short while was spent some four miles along a road leading from Taree to the coast. I found it a great labour-saving device to enlist several small boys in my service, and they were very helpful when they had decided that I was quite sane, despite my wandering round in a pre-occupied manner with a small tube of spirit and a large pair of forceps. In no

time they were lustily splashing in a little creek, trying to catch some of the swiftly moving pond-skaters (*Gerris australis*) that were to be seen in great numbers, skimming over the surface of the water. The most interesting find here was that of a large flattened oval-shaped water-scorpion

(*Laccotrephes tristis*), that was crawling gravely along the creek bed. These and other insects were kindly identified for me by our entomologists, and for further and fuller information I would recommend to readers an article which appeared in this MAGAZINE some time ago, describing amongst others, these members of the water-bug family.¹ When we reached the coast a few more insects were collected, the most striking being an immature leaf-bug (*Lyramorpha rosea*), which is shield-shaped and yellowish-orange in colour, with dark green markings on the back. On my return I found,

¹ Campbell, T. G., AUSTRALIAN MUSEUM MAGAZINE, III, No. 3, 1927, pp. 90-96.



"Razorback". This prominence, which is an island at high tide, is part of Halliday's Point (Blackhead) a seaside resort some twelve miles south-south-east of Taree. The eastward and seaward dip of the strata can be clearly seen.

[Photo.—R. O. Chalmers.]

to my amusement, that I had collected scarcely anything excepting bugs, so that I can scarcely refute the accusation if someone gives me the disparaging name of "bug-hunter."

The spot where we camped on the coast was on Khappinghat Creek or Saltwater, about three and a half miles south of Farquhar Inlet, the southern mouth of the Manning River, now almost entirely blocked by a sand-bar. This is one of the many coastal lagoons that are to be found in New South Wales. Other notable examples are Lake Illawarra, Narrabeen Lagoon, Myall Lakes. These lagoons, both big and small, are characterized by having the entrance always to the north, and

in the case of the smaller ones the entrance is nearly always blocked by a sand-bar. Along the coast there is abundant evidence of there having been a small uplift of fifteen to twenty feet. Strictly speaking it is not known whether this was due to an uplift of the land or a downward movement of



View from the top of "Razorback". Again the seaward dipping rocks can be seen with fine natural swimming pools between the resistant strata.

[Photo.—R. O. Chalmers.]

the sea. Many of the small coastal streams were thus brought slightly above sea-level, and the winds and currents have banked the sand up, usually forming a spit with the entrance to the lagoon at the northern end. Before this uplift such places as North and South Heads at Sydney were islands, but the uplift brought the submerged strips of land connecting them to the main coast up to sea-level, and, as in the case of the lagoons, the winds and waves have banked up the sand, forming dunes on these low-lying strips, which after the uplift were just awash and no more. Thus the two low-lying sandy parts of Rose Bay and the Corso, Manly, were recently under the sea. A fairly close examination of the coast was made from Farquhar Inlet to Halliday's Point, some eight miles to the south. It is low-lying country, and immediately behind the beaches is a flat stretch of typical dune-vegetation country, which gives place, as it goes inland, to the usual eucalypt scrub. A few good-sized hills, well in the background, do much to relieve the somewhat monotonous outlook. Notable amongst these are the Three Brothers, standing to the north of Taree, at a height of 1,900 feet.

There are three headlands on the coast between Farquhar Inlet and Halliday's Point, and the geology of this part is well illustrated by the excellent cliff sections that are to be seen. Geologically speaking, this part is quite old. It is referred to as Lower Carboniferous, that is, it belongs to the fifth division of the second great era in geological time, the Palæozoic era. Usually the close of each of these time divisions was marked by great earth convulsions, resulting in the raising of parts beneath the sea, the submergence of dry land, and the folding and crushing of apparently rigid rocks by reason of the stresses and strains imposed upon them.

Evidently the rocks in this part have been subjected to some influences of this sort. At one place there is a distinct break or fault, where the elastic limit of these rocks was exceeded in that far-off time. In another part there is a sharply folded inverted V, or anticline as it is

called. It is so sharp that it must almost have reached its breaking point due to the strain that it suffered.

At Halliday's Point the rocks have a fairly steep dip of about 45° in a general east-west direction. There is here an interesting example of what is known as differential erosion. In the main there are two rock types on this part of the coast and these are interstratified; the first, a highly silicified shale, which by reason of its hardness is very resistant to erosion; the second, a fragmental rock and not nearly as resistant. Some twenty-five yards out from the headland a bed of this tilted silicified shale stands out as a prominent stack. The process of wave erosion has removed the less resistant strata between it and the mainland, so that at high tide it is converted into an island. The strata dip seaward, and, as can be seen in one of the illustrations, some fine swimming pools are to be found between the parallel bands of rock.

CONCLUSION.

Many peaceful hours were spent in the sunshine of these green and gold beaches or in watching the summer lightning play at dusk on the surface of the lagoon at Saltwater. Yet Oxley, as he made his way from Port Macquarie to Newcastle in 1818, found many difficulties in the way. This band of travel-sore explorers had to carry a small whale-boat on their backs for the greater part of the journey in order to enable them to cross Harrington and Farquhar Inlets, the two mouths of the Manning, and also a great number of coastal creeks. Farquhar Inlet was certainly not blocked by a sand-bar in those days. They had also to contend with the blacks, who made an attack on the party at a place near Cape Hawke. Yet just as he reached his journey's end and importuned Governor Macquarie in the formal fashion of the times, so at the close of my journey would I importune the reader in a like, if somewhat misquoting manner, "respectfully hoping that on a perusal and inspection of the journals and photographs of the expedition, that the course I and my companion have pursued, will be honoured by your approbation".

Ethnological Notes

For some time past the Ethnological Galleries of this Museum have been undergoing revision at the hands of Miss E. Bramell and Mr. F. D. McCarthy. Considerable progress has been made though much has yet to be done ere the work is completed.

Exhibits of areas not hitherto represented are being prepared. The New Hebrides exhibit is a new one, and includes pottery, utensils, implements, weapons, ornaments, baskets and mats, and shell-money, but space does not permit of the display of masks from these islands.

A very fine series of spears and arrows with beautifully carved barbs of bone and wood, from New Hebrides, New Caledonia and Fiji is included.

Three examples—nine feet six inches, eight feet six inches, and three feet in length—of the large food bowls from the Solomon Islands have been placed on view in the case containing the Admiralty Islands wooden bowls and dishes. They are wooden, stained black, inlaid with mother-of-pearl and clam shell in pleasing patterns, and figures of birds and of human heads are carved at each end. Approximately one hundred new specimens are to be added to the Solomon Island exhibit in the near future.

Work is to commence shortly on the Polynesian and Micronesian sections, which are not at present on view. These comprise some hundreds of specimens, and when installed will make our display fully representative of Oceania. A splendid series of shark-teeth weapons and a suit of coir body-armour used by the natives of the Gilbert Islands, and also a number of fish-traps from various Micronesian islands have been placed on view.

Many new specimens of pottery, baskets, musical instruments, and weapons have been added to the African

section, and various weapons to the Indian and Oriental sections.

A very fine specimen of a grave-post from Melville Island, North Australia, on loan from the National Research Council, and also a grave-post of the Murngin tribe, from Crocodile Island, have been added to the Australian exhibit.

* * * *

Three stone axes of unique workmanship have come into the possession of the Museum. These were presented by Mr. J. Taylor, Assistant District Officer of the Mandated Territory of New Guinea, and Mr. M. J. Leahy, who have recently returned from a visit to the Mt. Hagen district of Central New Guinea. The axes consist of a working blade and two fighting blades of remarkable thinness and smoothness; all possess fine bevelled edges. It is no wonder that the natives regarded with comparative indifference the steel axes offered to them in exchange for food, seeing at first but little difference between the steel and the stone.

In addition to the axes were presented three elaborately barbed spears with fur grips, two head-dresses, one of parrot feathers and one of cassowary plumes, a man's plaited belt, two armlets, and a coloured clay whistle. The head-dress and belt show considerable manual dexterity and appreciation of colour; the spears are so cleanly carved that they appear to be executed with steel rather than with stone tools.

* * * *

Throughout Australia many places and natural features have names derived from the language of the aboriginal inhabitants. Numbers of these and their meanings have been recorded, but there must be many others which have not yet been listed. We should be glad to get information on this subject from those who are in a position to supply reliable particulars regarding aboriginal place names and their meanings.

Reviews

IN WILD NEW BRITAIN. The Story of Benjamin Danks, Pioneer Missionary. 293 pp. Angus & Robertson Ltd. 6s.

The natives of the Bismarck Archipelago have always had an evil reputation, and the many references given in this book to the interminable fighting between the villages, to cannibalism, and to their outbursts of unbridled passion and cruelty substantiate this impression. Although the lower jaw bone of the victim was kept for the purpose of display the tribesmen acquired a taste for human flesh, and often killed their enemies for the purpose of securing it; they ate all their victims, while surplus flesh was traded amongst friendly villages.

To be given the task of establishing a mission station amongst these people was the lot of the Rev. George Brown and Rev. Benjamin Danks, and their wives, in the early 'seventies and the account is typical of the work of the pioneer missions in Melanesia and New Guinea. It is a story of great courage and self-sacrifice. One realizes the fervour with which the missionary serves the cause to which he has devoted his life when one reads of the constant danger to which he is exposed, living and working in fever-ridden areas, amongst inhospitable savages. The unrelenting patience of Mrs. Brown and Mrs. Danks, even though they were in constant ill-health, arouses our deepest admiration. One is impressed, too, by the ability and faithfulness of the Samoan and Fijian teachers, who performed valuable work in the villages in which they lived.

Many aspects of native life, of which the missionary disapproves, are described, such as warfare, cannibalism, wife-

purchase, and the subjugated position of the women. The response of the natives to the attempts made to induce them to abandon these practices, to live in peace, and to embrace the teachings of the *lotu*, is related in a most absorbing manner. The deceitful and inconsiderate treatment of the natives by many of the traders and recruiters is deplored by the author, and to this cause, a great deal of unrest in the villages and the murders of white men by the natives, is to be attributed.

F.D.McC.

BLINKY BILL: THE QUIANT LITTLE AUSTRALIAN. Story and Illustrations by Dorothy Wall. 4to., pp. 60. Angus & Robertson Ltd., Sydney; 1933. Price 4s. 6d.

This delightful book for children deals with that little fellow to be met with only in Australia—the Koala—introducing him at birth and carrying him through that turbulent period in which, in his propensity for mischief and the seeking of adventure, he resembles his human parallel, the small boy.

The engaging little bear himself, as well as the other quaint characters such as Angelina Wallaby and Mr. Wombat, are amusingly depicted in the author's own profuse and charming illustrations.

Miss Wall makes an unobtrusive appeal for the protection of these harmless and fascinating creatures, the Koalas, which have been so shamefully treated that they are now comparatively rare.

This entertaining book is an ideal gift for the young, and no doubt children of a larger growth will also derive pleasure from its perusal.

NANCY B. ADAMS.