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THE AUSTRALIAN MUSEUM MAGAZINE

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The " Warrigal," Australia's wild dog (Dingo). Unique photograph of a pup. Only the aborigines are able to tame this animal.

[Photo.—*C. Barrett.*

THE AUSTRALIAN MUSEUM MAGAZINE

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VOL. III., No. 6. APRIL-JUNE, 1928

Notes and News.

The 1928 session of Popular Science Lectures will be inaugurated on April 26th by Mr. Tom Iredale who will take for his subject "Zoological Exploration in Australia."

These lectures, which are delivered in the Museum's lecture theatre at 8 p.m., are illustrated by Museum specimens and lantern slides or cinema. There is no charge for admission.

The complete syllabus is as follows :—

April 26th—"Zoological Exploration in Australia." Tom Iredale.

May 10th—"Australian Mangroves and their Inhabitants." A. Musgrave, F.E.S.

May 24th—"Nature and Sport on the Great Barrier Reef." E. F. Pollock, R.A.O.U.

June 7th—"Diamonds." T. Hodge Smith.

June 21st—"Nature's Realm by the Shore." W. Boardman.

July 12th—"Barrallier's Blue Mountain Exploration." R. H. Cambage, O.B.E., F.L.S.

July 26th—"From Cape to Cairo." E. J. Bryce, F.R.G.S.

Aug. 9th—"True Fish Stories." G. P. Whitley.

Aug. 23rd—"A Naturalist with the A.I.F." J. R. Kinghorn, C.M.Z.S.

Sept. 6th—"Our Aborigines." W. W. Thorpe.

Sept. 20th—"The Romance of Japan." E. C. Andrews, B.A., F.G.S.

Oct. 4th—"The Scenery of New South Wales." Prof. Griffith Taylor, B.A., D.Sc.

Oct. 18th—"The Science of Man." Prof. A. R. Radcliffe Brown, M.A.

As in previous years, a special series of lectures for Public School pupils will be given by members of the Museum staff. This series has proved not only an important adjunct to class work but a very attractive one to our juvenile friends. During the last session 2,000 children attended this series, and one of our principal suburban schools conducted an extempore test by asking its members, after attending a lecture, to prepare essays. The standard of these was high, some showing considerable merit, illustrating clearly and beyond argument the value of such training.

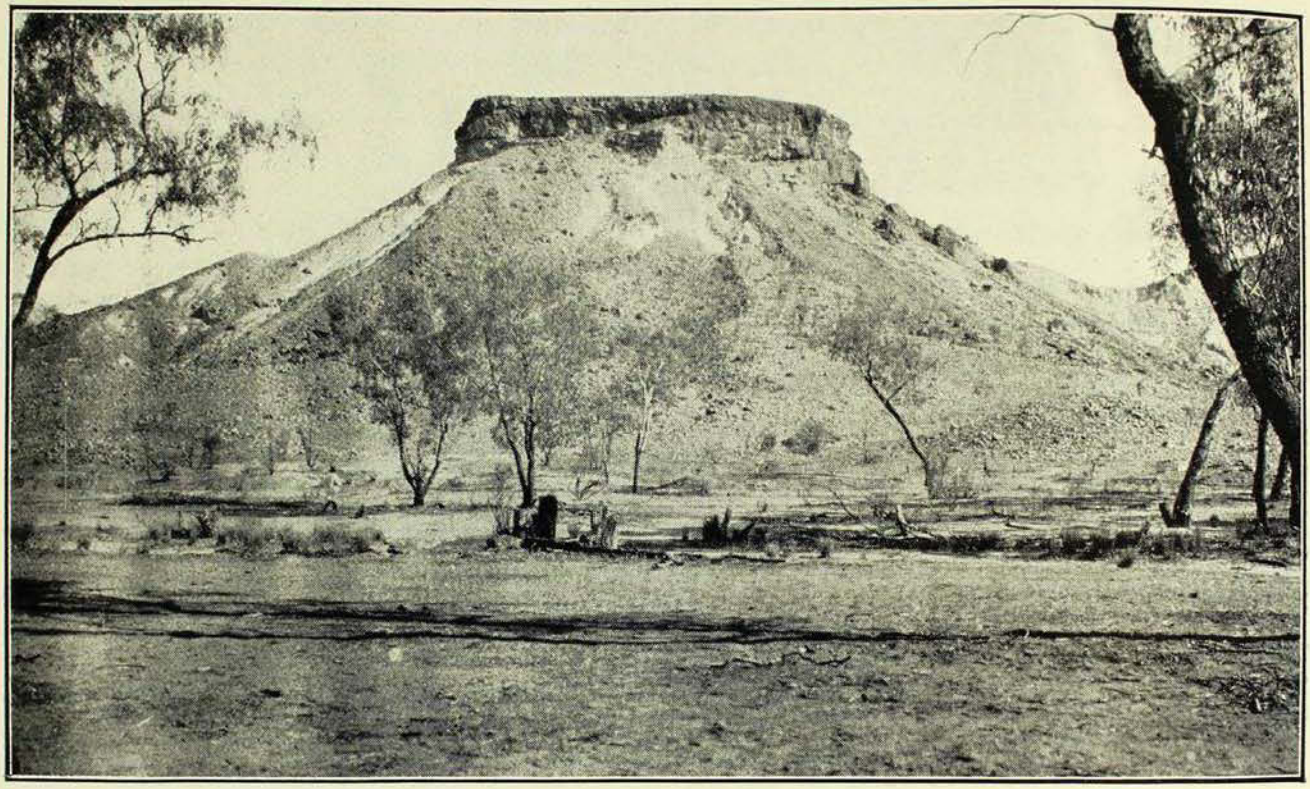
At the April meeting of the Board of Trustees of The Australian Museum, Professor A. N. St. G. H. Burkitt, M.B., B.Sc., was elected a Trustee in place of the late Professor Launcelot Harrison, whose death is noticed elsewhere in this issue.

Professor Burkitt, who occupies the Chair of Anatomy at the Sydney University, has been a frequent visitor to the Museum, material of which he has drawn upon for assistance in his researches.

Through the Land of Little Rain.

GLIMPSES OF NATURE IN CENTRAL AUSTRALIA

By Charles Barrett, C.M.Z.S.



Crown Point. One of the most conspicuous land marks in Central Australia.
[Photo.—*C. Barrett.*

FROM Oodnadatta to Barrow Creek, by the Overland route, is a journey of five hundred miles, monotonous or memorable, according to one's object in making it. Lacking an interest in natural history, botany, or geology, you travel through Central Australia at a disadvantage, and probably return to condemn that vast region as a "barren desert," practically useless to man, and as featureless as a brick wall.

Under a cloudless sky, the Land of Little Rain is outspread, with its gibber plains, watercourses that "flow" only with sand for years maybe, clay-pan pools that quickly dry after a rare shower has filled them, and miles on miles of arid land, treeless or covered in dusty scrub.

These are some features of the interior, but not all; they give but a partial picture. There are the ranges, and these wonderful relics of the country's past, before earth sculpture began. To a geologist, Central Australia is deeply interesting, and a rich field still for the anthropologist, while the general naturalist might spend months profitably in the Macdonnells or other ranges, and out on the mulga and gibber plains.

My own gleanings during a brief excursion in August indicate that Nature has many secrets to reveal in the Aruntas' territory, and that of other tribes, in the Central Mount Stuart country and beyond. Collecting insects chiefly, I took seven new species of ants, several new beetles, and other novelties. But discovery is only one phase of the naturalist's pleasant duty: he must be an observer of even common animals, since we have no complete biography of any species. The inland fauna

The "Whitewash Gum"—one of the most beautiful trees in Australia. The foliage is a lovely shade of green.

[Photo.—*C. Barrett.*

includes many forms of unique interest, as the rare Marsupial Mole (*Notoryctes typhlops*), whose lives are obscure. We have outline sketches, that can be filled in only after long and patient observation of the animal subjects in their haunts.

WILD GARDENS.

The central "desert," in August, recalled spring in Palestine. Even the brown, polished gibbers, millions of stones of all sizes, embedded and packed together, were gay with wild flowers. We travelled through barren lands, between Oodnadatta and Alice Springs, but every day, too, through natural gardens. Far as the eye could range, sometimes, the "desert" was alight with flowers, yellow and white, purple, light crimson, pink, and red. The salt-bush, good food for stock, was beautiful at that season. Our botanist was never discontented.

Among the Macdonnells grows the loveliest of all the eucalypts. They call it "Whitewash Gum," an uncouth name, but descriptive, for bole and boughs of this graceful tree of the steppes, are covered in a white dust-like substance, which adheres to the hand on light rubbing. Dead white it is, and in sunshine, against the blue unclouded sky, the trees gleam resistance and are dazzling as pillars of snow. It has recently been determined that the "Whitewash Gum" is not, as described by some authors, *Eucalyptus terminalis*, but *E. tesselatus*. We found it growing, not on the higher steppes only, but far north, along creek banks, in company with less distinguished allies. At Teatree Well it flourishes, and, hunting by torchlight there, I took numbers of insects on the white boles, including a tiny ant, undescribed.

Another notable plant of the interior, is the "living fossil," *Encephalartos macdonnelli*. One of my missions, on a visit to Simpson's Gap, was to photograph this cycad *in situ*. It grows only in these ranges, an isolated species of a group of fascinating plants. Less beautiful than *Bowenia*, of Byfield (Queensland), which I photographed a year or two ago, *Encephalartos* is quite as interesting, and its habitat is wild and picturesque. It grows high among rocks; many specimens seen were inaccessible, and a steep hard climb was the price we paid to reach a little cluster in the Gap.

Palm Valley, in the Macdonnells, gets its name from the presence there of groups of *Livistonia mariae*, which is nearly related to the common Cabbage Palm, *L. australis*, so abundant, for example, in parts of New South Wales, and with an isolated colony in south-eastern Victoria. The inland palms are confined to the wonderful valley of the Macdonnells. They give the tropical touch to a lonely spot, destined perhaps to be a popular resort when Alice Springs has grown into a thriving little city. Before that era, indeed, since the tourist already has discovered Central Australia, the Valley of Palms may have too many visitors. Vandals will come, as well as decent people. Even now, there are signs of their presence inland. Initials are scratched in the face of the rock on the Finke River, where geologists

On the Creek in Palm Valley.
[Photo.—*Dr. Keith Ward.*

seek evidence of glacial action; and aboriginal drawings at Ooraminna Rockhole have been defaced, scrawled over, or obliterated. Is there any limit to vanity and stupidity?

BIRD LIFE.

The birds of Central Australia have been dealt with by several noted ornithologists, as the late A. J. North, G. A. Keartland, and Captain S. A. White. I had faint hope of making discoveries, but sought for information respecting the Night Parrot (*Geopsittacus occidentalis*), a species very probably extinct now.

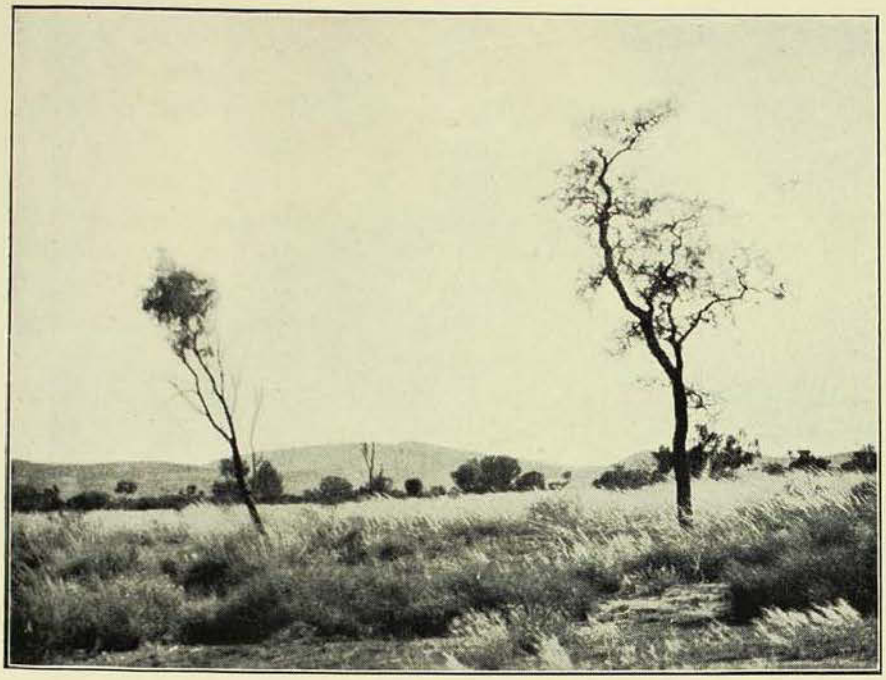
Captain White, during his ornithological explorations of the interior, failed to find the "missing bird," nor was F. L. Whitlock successful, when he visited Hermannsburg and Palm Valley a few years ago. But Whitlock obtained evidence of the existence of the night parrot in that country, while he was there. Some native boys had caught and eaten one of the birds—possibly almost the last of its kind. Cats brought in specimens to the telegraph stations years ago, when evidently the bird was fairly plentiful. And Whitlock learned from several inlanders that, formerly, the "Solitaire," as it was called, was flushed occasionally from the "porcupine" (*Triodia*) tussocks that cover wide tracts of the country.

Diligent inquiry last August was fruitless. Nobody seemed to know the night parrot. It may, as Mr. Whitlock believes, still exist in small numbers, especially in unstocked country, but I fear that we must regard it as lost, certainly as doomed to early extinction. Domestic cats gone wild are chiefly to blame.

Large flocks of Black Cockatoos (*Calyptorhynchus banksi*) we observed morning and evening around Alice Springs. At Heavitree Gap, about sundown they were always to be seen, flying in from distant hunting grounds. I could learn nothing as to their nesting haunts. At Teatree Well, on the dusty ground near the tank and troughs, thousands of galahs were feeding, late in the afternoon. They were wary. Natives, dressed for a corroboree at the Well, were decked with galah feathers, the pink-coloured ones from the breast. Some of the ceremonial objects used in the wild tribal dances were feather ornamented, too.

"Close up" of a Black Cockatoo.
[Photo.—*C. Barrett.*

Often, out in the open country, Wedge-tailed Eagles (*Uroaetus audax*) were observed, alone usually, circling high and widely. Some, that flew low, were noted as very dark in colour, and many were of noble size, with mighty wings. Black Kites (*Milvus migrans*) are very common birds of prey in Central Australia. Often we saw scores, sometimes nearly one hundred, wheeling low over the plain. These birds, also, were plentiful around station homesteads, and bold enough to swoop near an observer, in the quest for food. Crows were less venturesome.



Central Mount Stuart. This is not, as generally supposed, the real central point of Australia.

[Photo.—*C. Barrett.*

"They didn't come down this year," I was told, when I asked about Princess Parrots (*Polytelis alexandrae*). This was the reply to the "parrot question," in several localities. At Oodnadatta a Princess Parrot was seen in captivity. At Blood's Creek there were rumors of a nest of the rare and lovely birds; at Alice Springs they had not appeared for several seasons, report said. Doubtless Princess Parrots have unknown territory, which they leave at long intervals. Their movements are governed by seasonal conditions, and they may be absent from a district, within their normal range, for several years.

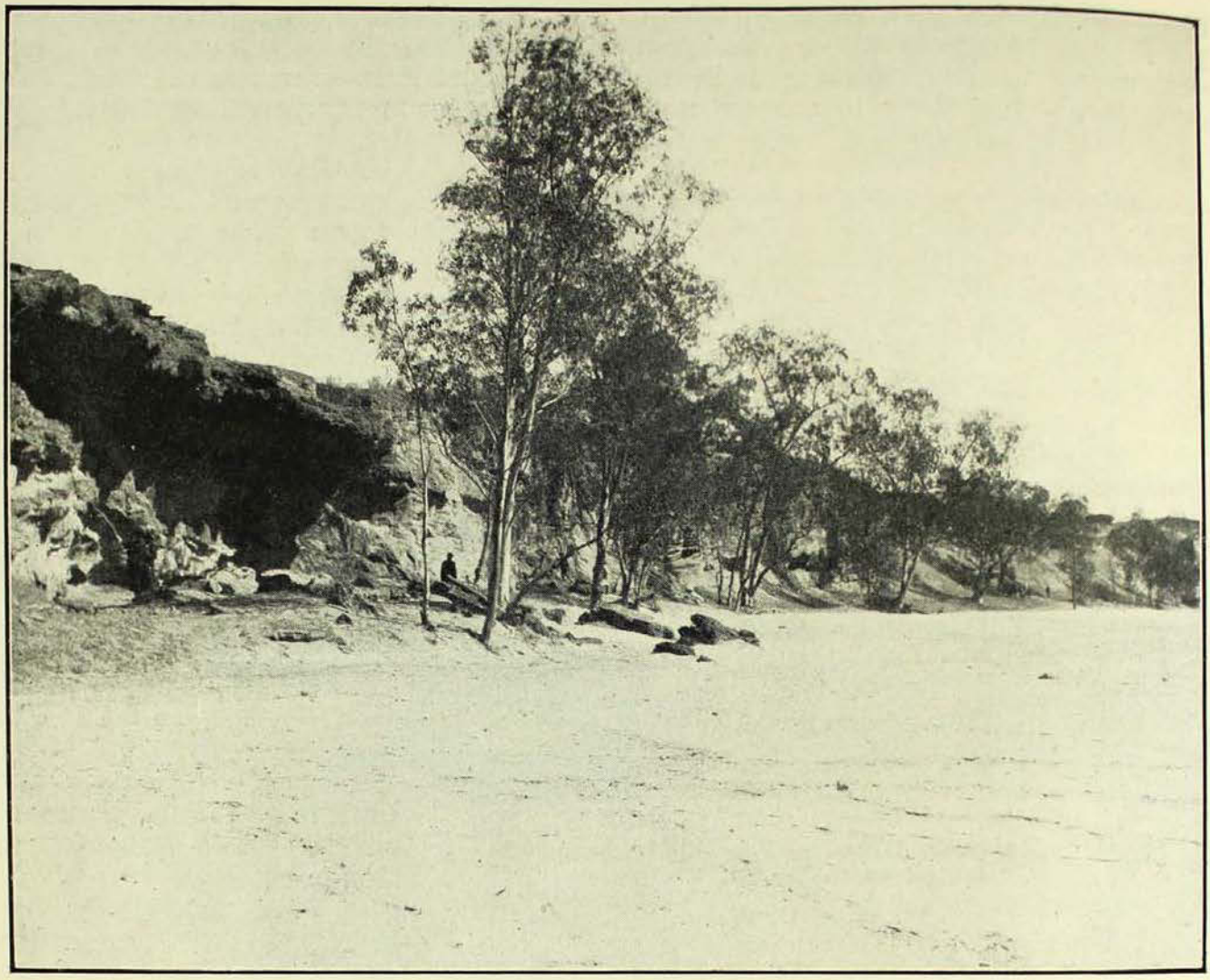
Among the long grass on Burt Plains, north of the Macdonnell Ranges, bustards, or Plain Turkeys (*Eupodotis australis*) were seen occasionally, two together as a rule. The white man, as well as the black, takes toll of these birds, whose flesh, unfortunately for the species, is delicious food. As the country is opened up, and sportsmen from far cities and towns begin to visit Central Australia, the bustards will steadily decrease in numbers. They have already become rare in many of their southern haunts, and from some have gone completely. It is difficult to save a bird that affords sport, and "makes good eating." Protection fails often to protect.

LOVERS OF THE SUN.

Of snakes I saw few in the Central region, but lizards were plentiful nearly everywhere. Perhaps a dozen species were observed. Sun lovers most of them; others lurked under stones, the loose bark of old gum trees, and logs that lay here and there around the wells. Watching a great flock of Zebra Finches (*Taeniopygia castanotis*) drinking, daintily perched around the rim of a huge open tank, I became aware of a lizard, watching me. It scuttled away as I moved, its hinder legs moving in the curious manner that has earned it the nickname, "cycling" lizard. "Racehorse" is another vernacular for this speedy reptile, which measures over a foot in length. It is a member of the great agamid family.

Goggle-eyed geckoes were found, under stones chiefly, wherever we looked for them. At Alice Springs, among rocks near a muddy pool, I had just a glimpse of the little water-dragon, notable for its long snout. *Physignatus longirostris* thrives where pools are few and running streams a novelty. Its cousin, the Eastern Water-dragon (*P. lesueurii*) would be most unhappy in Central Australia, if it could contrive to live there at all; its habits are essentially aquatic, and it loves to drop from an over-hanging bough, or a rock, into deep, running water.

Spider life is not very conspicuous in Central Australia, but a new (?) species of



The very centre of Australia (determined scientifically). A cliff on Finke River, where there is evidence of glacial action.

[Photo.—*C. Barrett.*

trap-door spider was plentiful in some localities. Its retreats, with neat, round, hinged door-ways (really " swinging roofs "). were seen in dozens along a dry water-channel. Other spiders were found among foliage, under bark, and in rock crevices.

The troughs at wells lure thousands of insects, from water-beetles to large, black and yellow-banded wasps. At Hamilton Bore, I devoted time to aquatic insects. Here, dragon-flies darted from the reeds and back again; some were azure-coloured, others crimson, and some had pale-amber-grey bodies, and were so feeble in flight that a touch sent them into the water. Rocks about a pool at Alice Springs were studded with empty pupal cases of a big drab-coloured dragon-fly. Here, also, were water-snails (*Isodora newcombi*), water-boatmen, and long-legged bugs (*Gerris*), skating over the surface with amazing speed, and dodging my dip-net cleverly.

Clay-pan pools of water only a few inches in depth and of pea-soup consistency, were crowded with crustaceans, *Apus* and *Estheria*. Looking at those weird creatures, miniature King-crabs in appearance, and watching their struggles to avoid being eaten alive by water beetles, one was reminded of imaginary pictures of primeval life. The clay-pan was a chamber of horrors.

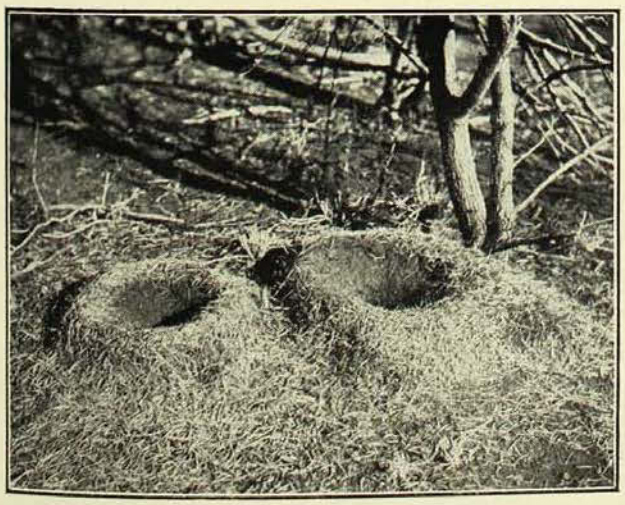
Life is very brief in a Central Australian pool on the plains. The water evaporates quickly, and all the living creatures that inhabit it go swiftly through the cycle of living. As Sir Baldwin Spencer says, the rate of growth of *Apus* and the *Estheridae* must be very great. Before the rains not an *Apus* will be seen in a clay-pan pool, where, about a fortnight after rain has fallen, well-grown specimens abound.

Honey-pot ants (*Camponotus inflatus*) are not rare, but, unless searched for, are unlikely to be seen. I discovered several colonies at Alice Springs. Entrances to their citadels were near, or under rocks. On the surface no "repletes" were seen. The aborigines dig them out, and enjoy sweets that nature has provided. The "Yarumpa" is as dear to the blackfellow as lollies are to children, and in favoured districts he has a good share of the luxury.

Leaf-tiled craters of the "Mulga Ants" (*Polyrachis macropus*) are a feature of the landscape north of Alice Springs. We saw thousands of these remarkable nests on the Burt Plain. The crater walls are covered in dry mulga leaves. The ants are thatchers as well as miners, and the nest-tunnels go deep down.

Termites, of course, have vast cities on the plains. The turrets begin to appear in numbers not far north of Alice Springs. They are not nearly so tall and striking as the citadels of northern Australia. One species forms the curious stone-hard circular pods, conspicuous along the Overland Track, and through the mulga. An inlander spoke of "spitting ants," and declared that the circles of bare smooth ground, hard enough to turn a knife-point, were due to hosts of ants directing tiny jets of acid on the surface!

A pod was dug out, and the termites were revealed, crawling among galleries, and shallow chambers, stored with finely chopped porcupine-grass stems. It was suggested that hosts of these unlovely insects might be trained as road-makers, to level and harden the permanent way across Australia. The humorist laughed and hinted that a new chum tourist might like his notion, if it did not appeal to me.



Ants' nest craters "thatched" with dry mulga leaves. These remarkable structures are the work of Polyrachis macropus.
[Photo.—*C. Barrett.*

Arunta man throwing spear with womera, Burt Plain, Central Australia.
[Photo.—*C. Barrett.*

Dingoes, though we have warred against them for half a century, abound still in many parts of Australia, and the Central region has its full share. At night, camped upon a waterhole, or among old gums or mulga, in the bed of a waterless creek, one heard their voices—hardly musical sounds. But rarely was a dingo seen, excepting in the blacks' camps on some of the stations. Half-bred mangy curs of the wild dog strain, and nondescripts innumerable are owned by the aborigines. Mostly mongrels these dogs are, but some may be classed as fairly good specimens of well known breeds, as pointers and kelpies, while greyhounds are especially favoured, judging by the many seen among the mia-mias. One old hunter of kangaroos and emus in the ranges and

out on the plains, proudly "introduced" his dog, Dr. Keith Ward told me, as "Romeo." He was proud of his dog's prowess in chasing emus, and rolled out its name as though it were, indeed, a title of distinction.

Dogs lie among the piccaninnies and lubras, crouched about the little fires that are the black folks' best friends on chilly nights and mornings. Bitter frosts are not unusual, even in spring, in Central Australia. The dingo pups are most engaging, as pert looking and as pretty as the sledge dogs used by Antarctic explorers.

The naturalist, to round off his general knowledge, must wander and observe in all classes of country. He must go to biological headquarters in the tropics, to the cool regions of the south, and east and west, across plains and over mountains. He cannot afford to neglect the great central territory, the "desert" that blossoms in spring, the gibber country, the wonderful ranges—any province of the Land of Little Rain.

Obituaries.

EDGAR RAVENSWOOD WAITE.

The death of E. R. Waite, Director of the South Australian Museum, took place on January 19th, at Hobart. Although already a sick man he courageously travelled to Tasmania to attend a meeting of the Australasian Association for the Advancement of Science, but, on reaching Hobart, he was immediately taken to hospital, and passed away after a few days' illness.

He was born at Leeds, England, in 1866, and was educated at the University there. In 1888 he became Curator of the Leeds Museum, and in 1892 he came to Australia as Assistant in Charge of Vertebrates in this Museum. In 1906 he was appointed Curator of the Canterbury Museum, Christchurch, New Zealand, and in 1914 he became Director of the South Australian Museum.

Waite had a wide knowledge of zoology. He was a specialist in fishes, and will be remembered chiefly for his important contributions to Australian and New Zealand ichthyology, but he was also an authority on mammals, amphibia, and reptiles, and had a considerable knowledge of insects.

Soon after his arrival in Sydney he was chosen to accompany H.M.C.S. *Thetis* on her trawling trips off the coast of New South Wales in 1898, and to the *Memoir*, issued by the Trustees of the Australian Museum describing the scientific results, he contributed a comprehensive introduction and a report on the fishes. On removing to New Zealand he had further opportunities for deep sea and coastal investigations, and twice he visited Macquarie Island for scientific purposes, and joined an expedition to the Sub-Antarctic Islands of New Zealand. He described the fishes collected by the Australasian Antarctic Expedition led by Sir Douglas Mawson, and was the author of a valuable work, "The Fishes of South Australia (British Science Guild, S. Australian Branch, Handbook, 1923). At the time of his lamented death he had nearly completed a work, "South Australian Reptiles and Frogs."

Exceedingly versatile, Waite was thorough in all his work. He was a first-class artist with pen and water colours and no mean performer on the flute, while he possessed mechanical ability of a high order. His versatility and ingenuity made him one of our foremost museum administrators and workers. Personally he was genial and obliging, and always willing to assist others. Capable, generous, and sincere, he had many scientific and other friends who will mourn his loss.

C.A.

PROFESSOR LAUNCELOT HARRISON.

The sudden death of Professor L. Harrison, which took place at Narooma on February 20th, has removed an active and valued member of the Board of Trustees and one of the most distinguished of Australian zoologists.

The son of the late Dr. Thomas Harrison, he was born at Wellington, N.S. Wales, in 1880, and educated at The King's School, Parramatta, where he proved himself an apt scholar. From his boyhood he was a keen student of nature, and when in 1911 he entered the Science School of Sydney University he had already made his mark as a naturalist. In 1913 he graduated B.Sc., after a distinguished career as a student. In 1914 he was awarded an 1851 Science Research Scholarship and proceeded to Emmanuel College, Cambridge, where in 1916 he obtained the degree of B.A. (Research).

During the Great War Harrison volunteered for service, and in 1916 he was asked by the War Office to proceed to Mesopotamia as Advisory Entomologist to the expeditionary forces. In this capacity his work in limiting the spread of insect-carried diseases was of great importance. He was promoted from the rank of lieutenant to that of captain on the special list, reserve of officers.

In 1918, while still on active service, Harrison was appointed Lecturer and Demonstrator in Zoology at the University of Sydney, where he took up duty in July, 1919. In September, 1920, he was appointed Acting-Professor of Zoology, and, later, he succeeded the late S. J. Johnston in the Chair.

Professor Harrison was an inspiring and successful teacher and lecturer, with the faculty of making his subject interesting to his hearers. He inculcated the research habit in his students, and his influence in this direction can be seen in the valuable work which in recent years has emanated from the Department of Zoology. He himself had made important contributions to zoological science. He was one of the world's authorities on the Mallophaga, or Biting Lice, parasites on various birds and mammals, and by his study of these forms he had been able to trace unexpected relationships among their hosts. He was also a keen student of frogs, to our knowledge of which he had made valuable contributions. He was deeply interested in the problems of zoogeography, especially as regards the origin of the Australian fauna, and an ardent and able supporter of the view that the southern continents were formerly brought into close relations by an extension of Antarctica. His last published paper appeared in the *Records of the Australian Museum* in January of this year and dealt with the occurrence in Madagascar of a new species of *Stratiodrilus*, a genus of primitive worms parasitic on fresh water crayfishes. In the known distribution of these peculiar parasites, which had been previously described from Australia and South America, Professor Harrison saw a strong argument in favour of the Antarctic connection which he had defended so ably in his Presidential Address to the Zoological Section at the Perth meeting of the Australasian Association for the Advancement of Science (1926). Harrison was an accomplished ornithologist and entomologist, and for some years before his death he had been working on the anatomy and development of the platypus.

Besides being a versatile zoologist Harrison was a skilful artist and a clever writer of verse. His verses for children and his amusing book, *Tails and Tarradiddles* have delighted many children, young and old.

Harrison had taken a prominent part in scientific bodies. At the time of his death he was President of the Linnean Society of New South Wales, and he had been President of the Royal Zoological Society of New South Wales.

He was elected a Trustee of the Australian Museum on April 4th, 1924, and had been Chairman of the Scientific and Publication Committee since 1925. At the meeting of the Board, held on March 2nd the following resolution was adopted: "That the Board of Trustees of the Australian Museum hereby place on record its profound regret at the sudden death of Professor L. Harrison, and its sense of loss sustained thereby by the Museum, the University of Sydney and zoological science. The late professor had rendered distinctive service to this institution since his election to the

Board as a Trustee, and as a Chairman of the Scientific and Publication Committee. His death will be keenly felt at the University, of which he was one of the most distinguished workers in the Science School. A gifted and original teacher, he stamped his personality on his students, and Australian zoology has lost one of its greatest men. He had been called to occupy most of the prominent positions in the scientific societies of Australia. His services, placed during the Great War at the disposal of the War Office, resulted in materially reducing among our forces in Mesopotamia the mortality caused through insect-carried diseases, but his unselfish devotion to his military duties undermined his own health and contributed to his early death."

C.A.

Reviews.

The Crustaceans of South Australia, Part I. By HERBERT M. HALE, Zoologist, South Australian Museum. (Harrison Weir, Government Printer, North Terrace, Adelaide, 1927).

This work is at once a text book and a popular contribution to the study of crustacea. It is the first work of its kind on Australian forms and will be welcomed by both the scientific and lay community. The exhaustive manner in which the subject matter has been treated reflects great credit on its versatile author, who is already well known for his numerous excellent papers in several branches of natural science.

The book opens with a full and entertaining discussion on the history of Australian Crustacea, the use and application of scientific names, comparative structure of various groups and their affinities, methods of collecting, preservation, and classification. The fact that essentially Australian types are used as examples in these opening chapters renders that portion of the work particularly suitable for use in Australian universities.

In the systematic section is included easily comprehended keys to the numerous species of crustacea from South Australia, accompanied by a short description and an excellent illustration of each.

Part I. of the "Handbook" deals completely with the crabs, lobsters, crayfish, prawns and hermit-crabs; part 2 is in course of preparation and will describe the great majority of smaller crustaceans, both salt and fresh water, which occur in South Australia.

F.A.McN.

The Coolah Valley and the Warrumbungle Range. By C. BRUNSDON FLETCHER. CORNSTALK PUBLISHING COMPANY, Sydney, 1927. 8vo., 148 pp., illustr. (Angus and Robertson, Sydney, 3/6.)

Know your country and, incidentally, its explorers, would appear to be the keynote of Mr. Fletcher's theme, for in this companion volume to his *The Murray Valley*, he treats exhaustively of the discovery of that district in New South Wales in which lie the curious Warrumbungle Mountains, and their natural southern approach, the Coolah Valley.

Dominating the work throughout is The Shade of Allan Cunningham that "Prince of Australian Explorers" as he has been termed, who, in 1823, five years after the Range had been discovered by Oxley, discovered and named Pandora's Pass at the head of the Coolah Valley. This natural means of access to the Liverpool Plains, has never been utilised, and "The Pass is to-day in the same condition as when he first discovered it."

Mr. Fletcher has delved deeply into the past history of the district, and his researches should prove of considerable interest to those who find pleasure in Australian geography. The author also gives illuminating accounts of the district as it is to-day, and its attractions for tourist and pastoralist. He deplores the failure in the past to use Bell's Line, that old aboriginal track between Richmond and Bell, as part of a road to the west and north, but predicts that " Sooner or later the railway traffic, passenger and goods, will prove too much for the present Western line across the Mountains, and Bell's Line will then come to its own, as a complement in carrying the load."

The book owes its inception to a series of articles from the pen of Mr. Fletcher in the pages of the *Sydney Morning Herald*, which form the basis of the work ; these have been considerably amplified and revised, and three interesting appendices are added.

Many fine references to Allan Cunningham are made throughout the work and, as the author feels that the name and fame of the explorer is still unfamiliar to most, here " it is written afresh in large letters," the author modestly adding " this alone may justify the little book now offered to the reader."

A.M.

The Ant People. By HANS HEINZ EWERS, translated from the German by CLIFTON HARBY LEVY. THE BODLEY HEAD, London, 1927. 8vo., 319 pp. and appendix, illustr. (Angus and Robertson, Sydney, 8/6.)

This very readable book on the habits of ants, is from the pen of a German writer, Dr. Ewers, who " has poked his nose into Ant nests in every land." In simple language he tells us of the wonders of ant communities, how they live and work, their methods of securing food, or growing it, as in the case of the fungus-growing ants, or keeping ant lice or aphids for their sweet exudations.

Many of the facts concerning the ants about which he writes have been dealt with at length by other European and American writers on popular myrmecology, but the author has introduced much that is novel and entertaining .

His statements relating to his experiences with our Bull-dog ants, savour of hyperbole. " All are desert dwellers " he tells us, while " some are great jumpers, leaping a foot at a time." Most readers of the *Museum Magazine* are only too well aware of their presence in Eastern Australia, as many a bush picnic has been spoiled by the discovery, too late, of a nest of Bull-joes or Jumpers. Our jumper ants are quite incapable of leaping as high as one's knees as he affirms, but progress by a series of quite short leaps. His statement that " They seem to be fond of bathing and are splendid swimmers " is erroneous, as anyone knows who has seen a member of the genus *Myrmecia* struggling in the water. Indeed in his account of our Bull-dog ant, " the prototype of all ants," as that great myrmecologist, Professor W. M. Wheeler, has termed it, the author seems to have sacrificed fact to fancy, thereby detracting from the value of an otherwise entertaining and instructive book.

A.M.

The Bush Boy's Book. By DONALD MACDONALD. Angus & Robertson, 1927. Price, 3/6.

Probably Australians spend more time in the open air than any other people, and the zest for camping and life in the out-of-doors is born in every Australian boy. Camp lore is acquired only by experience, but this work is an excellent text-book and will be useful even to the experienced camper and bushman. It contains hints on the selection of camp sites and tents, describes the various kinds of camp beds, and includes a useful chapter on cooking and various ingenious adjuncts to the bushman's " kitchen." Other objects dealt with in an instructive and interesting manner are shooting, fishing, snake bite, and how to find the way.

C.A.

The Kingsgate Molybdenite Mines.

By T. Hodge Smith.

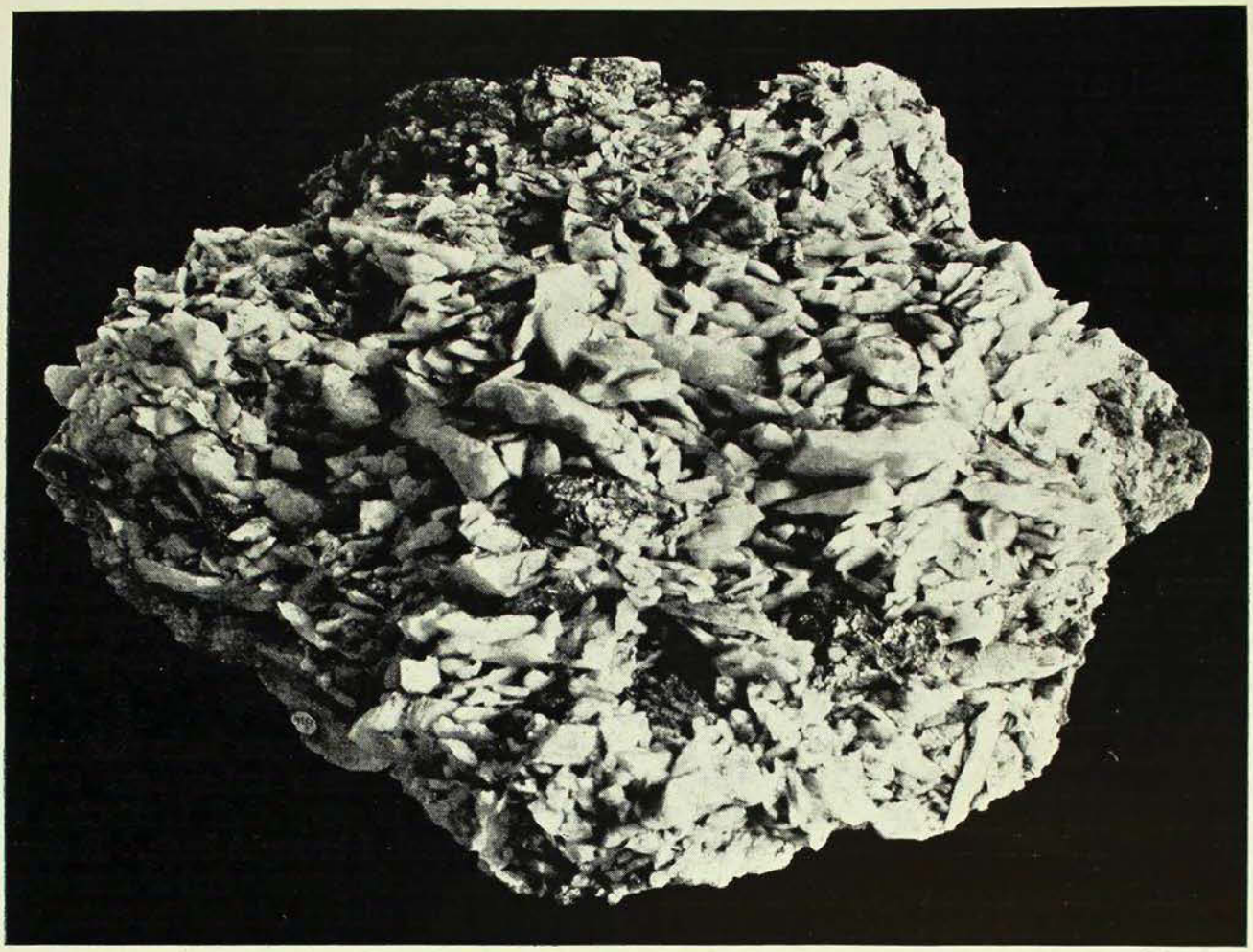
Sachs' Mine, Kingsgate. Three specimens—5 cwt., 6 cwt., and 80 lbs., respectively—torn from one mass of molybdenite.

(After Andrews—Mineral Resources)

THE invitation of Miss P. Sachs, owner of a number of the mines at Kingsgate, twenty miles east of Glen Innes, New South Wales, to visit the field with a view to collecting any material that might be of use to the Museum, was an opportunity which I availed myself of with pleasure. While at Kingsgate I was the guest of Miss Sachs,and every assistance in examining the various mines and securing specimens for the Museum was rendered by her manager, Mr. H. Marshall.

Molybdenite is a mineral consisting, when pure, of sixty per cent. of the rare metal molybdenum and forty per cent. of sulphur. It is very soft, having about the same hardness as talc, but it is more than four and a half times as heavy as an equal volume of water. It cleaves or splits up into very thin sheets which are quite flexible but not elastic. The colour is pure lead-gray and the lustre is metallic. In fact it much resembles graphite in appearance. It was Scheele, the Swedish chemist, who in 1778-1779 first established the distinction between graphite and molybdenite. At Kingsgate a number of very beautiful crystals of this mineral have been obtained, and due to the generosity of Miss Sachs quite a number of them have been procured for the Museum. They are tabular and hexagonal in form, and in some cases these flat crystals are so joined together as to form a rosette-like assemblage.

Molybdenite is extremely valuable for hardening and toughening steel, and its importance has been realised only recently. During the Great War of 1914-1918, it was very much sought for, and in consequence, extremely high prices were obtained for it. Its



This specimen consists of fragments of quartz and molybdenite, which, owing to earth movements shattering the lode in part, have fallen in a heap and have been cemented together by silica.

[Photo.—*G. C. Clutton.*

principal use is in the production of molybdenum steel for the manufacture of armour plates, shells, and high-speed tools. In many respects this resembles the better known tungsten steel, but is superior to it in hardness and toughness. As molybdenite contains forty per cent. of sulphur it cannot be added direct to the steel. It is first necessary to make a ferro-molybdenum alloy, which process is carried out in an electric furnace. The ferro-molybdenum is then added to the molten steel in whatever proportion is desired.

In ceramics, compounds of molybdenum are used as colouring agents, while the chemist uses ammonium molybdate in both qualitative and quantitative determinations of phosphorus.

The rock or material which contains the mineral to be mined, whether it be gold, copper, or molybdenite, is usually spoken of as the gangue, while the whole, that is the mineral and the gangue, is known as the lode, and country rock is the name applied to the rocks in which the lode occurs. If you were to ask a gold miner what a lode looks like, he would most probably tell you that it was a vein varying from a few inches to many feet in width, traversing the country rock and extending downwards for a considerable depth. This would be a true description of the majority of lodes, but at Kingsgate the lodes are in the form of irregular cylindrical masses known as "pipes," which are always found close to, but not at the junction of a coarse siliceous granite with claystones of unknown age, probably older than our coal measures. The granite is invariably the country rock, and, although fifty-four of these pipes are known to occur at Kingsgate, they have never been found in the claystones. They vary in diameter from eighteen inches to as much as forty feet, and any one pipe

may show a variation as much as this. They are seldom if ever vertical, but generally run parallel to the contact of the granite and the sedimentary rocks, though their course is exceedingly erratic. They are composed mainly of quartz, with such valuable minerals as molybdenite, bismuth, wolfram (tungstate of iron and manganese), and cassiterite (oxide of tin).

In the old days, some of the pipes were worked for their bismuth content only. The bismuth is found in the metallic state, and some very large nuggets of this mineral have been produced from these pipes. The sulphide (bismuthinite) and the carbonate (bismutite) are also found in quantity. From the "Wet Shaft" were obtained specimens of bismuthinite consisting of very fine hair-like crystals, forming a kind of felted mass. This is found in vughs, or cavities, in the lode and often entirely surrounds peculiar flat pieces of transparent quartz, which on first sight, appeared to be fragments, but on closer inspection proved to be complete crystals of most unusual habit.

Frequently fairly large vughs occur which are generally productive of very beautiful crystals of quartz, some as much as two feet in length, others quite small, but displaying great variations in shape; the central portion of the pipes is often composed of very coarsely crystallised quartz. In the vughs are found crystals of molybdenite, already referred to. They also occur entirely enclosed by a peculiar, fractured, semi-translucent, white quartz. It is possible to obtain beautiful groups of these crystals of molybdenite by carefully removing the quartz, fragment by fragment, with the aid of an ordinary pocket knife. The molybdenite is occasionally found in large sheets, but more often it occurs as flakes disseminated through the quartz.

Although wolfram and cassiterite are found associated with the molybdenite, they are relatively unimportant. Generally speaking there are two types of pipes, the bismuth-molybdenite type and the wolfram-cassiterite type. In the former, characteristic of Kingsgate, the distribution of the bismuth and the molybdenite is worthy of note. This bismuth is generally confined to what the miner has termed the "gutter," that is to say the underneath side or footwall of the pipe, while the molybdenite follows the top side or hanging wall.

According to Mr. E. C. Andrews, B.A., Government Geologist, and a Trustee of this Museum, the pipes are formed after the cooling of the magma, that is the molten rock responsible for the granite, by the action of hot aqueous acid solutions and gases associated with it. These solutions, rising from great depths, found their way along intersecting joint planes in the solidified granite, near its contact with the sedimentary rocks. By decreasing heat and pressure the solutions deposited their content of silica, in the form of quartz, along with the valuable ores that are now being extracted from the pipes.

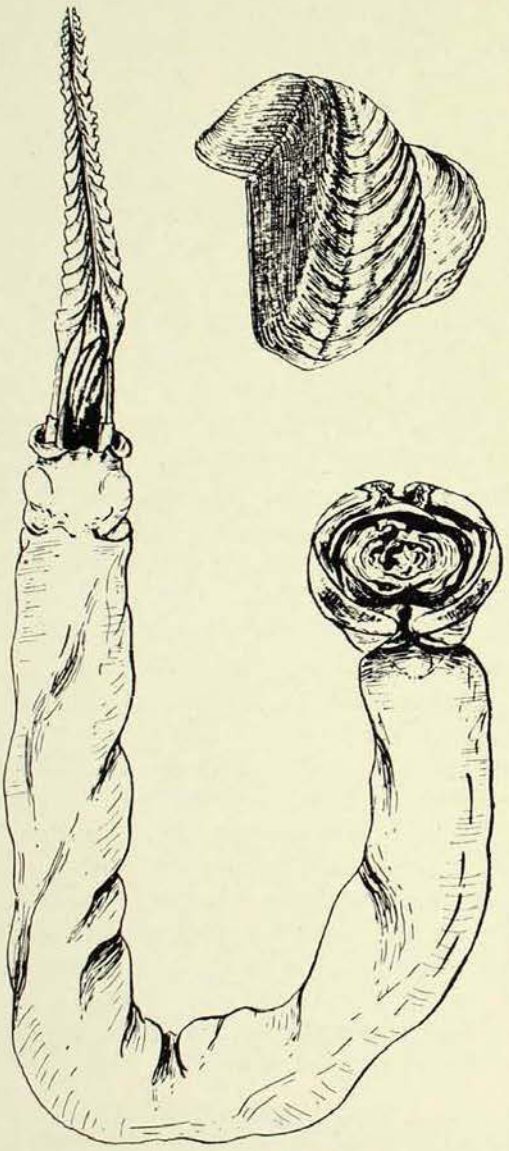
That these pipes have been subjected to stresses and strains subsequent to their consolidation is very well illustrated in a specimen which I brought back. It consists of innumerable fragments and broken crystals of quartz and pieces of molybdenite, which have been cemented together, not too firmly, by secondary silica. A specimen of what the miner calls "Doughboy Lib" is another illustration of this point. It consists of molybdenite which has been crushed to a fine powder, consolidated by pressure, and the surface polished by movement under this enormous pressure against the adjacent rocks.

Leaving the fertile country around Glen Innes, one passes through Red Range almost imperceptibly into the rough country surrounding Kingsgate. After admiring the wild scenery, the thought rises immediately in one's mind what useless country it is. Yet such is the wisdom of Nature. Working on the junction of the softer sedimentary rocks with the hard granite by means of wind, rain, and rivers, Nature has removed the softer rocks, forming deep rugged ravines and exposing to view the pipes containing valuable ore, which otherwise would have been locked away as one of her secrets.

War Against Pests.

By Tom Iredale and Frank A. McNeill.

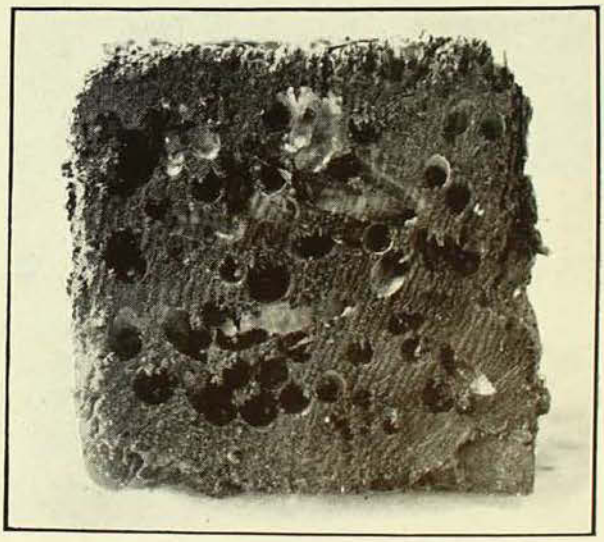
THROUGHOUT the world man is continually waging war against small animals which attack and destroy his handiwork. In many instances the difficulty of combat is accentuated by the reason that these enemies have to be fought in their own domain, into which man has introduced more attractive food or homes. Thus certain marine animals, which are now rightly regarded as very destructive pests, lived harmlessly for ages in the small wrack drifting about the seas and thereby served their useful purpose as scavengers in the general scheme of Nature. In our modern age immense structures are placed at their disposal and they have energetically accepted the tempting invitation to live and board easily and well at man's expense.



Animal of Cobra (Bankia australis) showing the muscular boring foot and protecting valves at one extremity, and the ear-of-wheat like palettes at the other. At top is illustrated a single valve of the animal. Enlarged.

[*Joyce K. Allan*, del.

Although the marine animals in question have been regarded as pests for centuries, only recently have the authorities recognised the importance of taking urgent preventive measures, for which many causes outside the scope of this article are responsible. At the present time extensive investigations are being carried out to prevent or check the progress of marine pests in the port of Sydney.



Cross section of a piece of wood showing internal damage done by cobra.

[Photo.—*G. C. Clutton.*

As in other parts of the world, the main depredators of our wharf piles are members of two classes of animals (Mollusca and Crustacea), which accomplish their work

Same piece of wood showing external attack by crustacean pests, which in some parts has exposed the shell-lined tubes of the cobra.

[Photo.—*G. C. Clutton.*

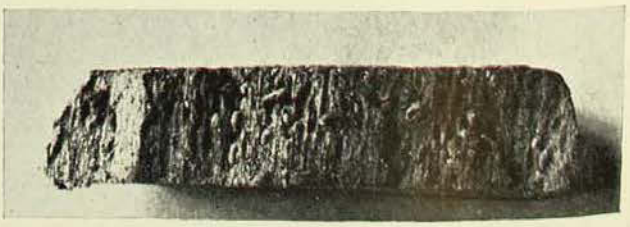
of destruction in entirely different manners, so that the words of the old nursery rhyme—

> Jack Sprat could eat no fat,
> His wife could eat no lean;
> And so betwixt them both, you see,
> They made the platter clean.

are peculiarly applicable. Thus, while the Mollusca or shell-fish known as "Cobra" are eating out the internals of the timber structures, the crustacean forms *Limnoria* and *Chelura* are just as vigorously destroying the outer layers.

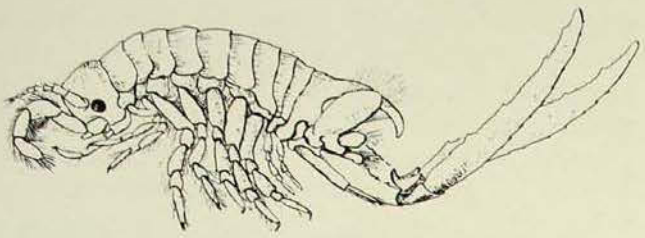
For the reason of their hidden workings, the various species of "cobra" must be considered the most destructive agents. The term "cobra" is a native Australian word used here to designate these curious destructive molluscs. From their attenuated forms and soft bodies they received the old world name of shipworms, for in the days of wooden ships they were a dreaded scourge. Even in the widest sense of the term, however, these animals are far removed from the worms, hence our preference for the local vernacular.

The cobra begins life as a minute free-swimming larva, which has a regular bivalve or double shell form comparable to that of the common cockle. Almost immediately it settles down and undergoes a curious retrograde development. This is accomplished in the action of penetrating the surface of a wooden structure selected for attack. The erstwhile delicate tapering foot protruding from the valves becomes a muscular boring organ to effect the lodgment of the rest of the body. The initial entrance of the cobra is gained through a tiny hole, the small diameter of which can be imagined from the fact that the animal at this stage is approximately 100th of an inch in length. In the security of its new home, the valves of the cobra become modified simply to protect the foot, which from now onwards must carry out the whole of the extensive boring operations. Two specially developed tubes known as the inhalant and exhalant siphons remain at the point of ingress to establish permanent communication with the outside water, while the body elongates, being literally carried forward by the shell-enclosed boring foot as the animal rapidly progresses on its trail of destruction. Thus is formed the characteristic worm-like body, through the total length of which the above mentioned siphons are continued as passages with a dividing wall formed by the gills. Another curious and unique character of the cobra is the possession of a pair of shelly particles called palettes, which is a name derived from their commonest form. At other times these structures assume a shape like that of an ear of wheat. The palettes are



A chip of hardwood being attacked along the end grain by the gribble (Limnoria). The individuals illustrated are natural size.

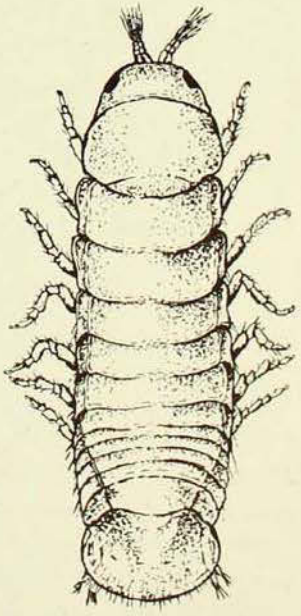
Photo.—*G. C. Clutton.*



The Amphipod, Chelura cambrica, the most destructive crustacean wharf pile pest in Sydney Harbour.
[*Joyce K. Allan*, del.

embedded by their stalks in the soft tissue at the extremity of the cobra, and function as a protecting plug or operculum to block the entrance of the burrow whenever the animal temporarily withdraws its delicate siphons.

The steady inexorable boring of the cobra quickly perforates and destroys the wood which shelters it, and its short life of upwards of a year is spent in a daily battle for mastery of its shelter against the savagely attacking crustacean pests which are continually making inroads on the timber from the exterior. These latter forms are related to the crabs, lobsters, and shrimps. Like them they are composed of a segmented body, but in the place of the often characteristic claws or nippers of those forms, these timber borers have powerfully developed jaws or mandibles, which are admirably adapted for breaking down the fibres of the wood they infest. With *Limnoria* in constant association, the form *Chelura* is the most voracious and perhaps the most important of the crustacean pests in the port of Sydney. This creature has no vernacular name, but it is an aberrant member of the crustacean group Amphipoda, which includes the common sand-hoppers of every shore. *Chelura* grows to a little over one quarter of an inch in length in our waters ; it has a small head bearing two pairs of short, strong antennae and midway along the back projects a conspicuous sharp spine. At the hinder end of the segmented body is a pair of large tail appendages (uropods). These last are greatly developed in the male, and appear to assist both sexes as shovelling organs for removing the wood debris from their burrows. The shovelling theory is suggested by the peculiar flexing of the body when *Chelura* is crawling about. It does not hop when disturbed, but progresses by drawing the hinder part of the body towards the front, and, when the back of the animal becomes sufficiently humped, the rest of the body is projected forwards in a manner which suggests that it has been thrown off its balance. *Limnoria*, sometimes popularly termed the Gribble, is a smaller creature than *Chelura*, and attains to a length of approximately one-sixth of an inch. When working with its associate *Chelura*, it occurs deeper in the wood or further from the outer surface than that form, and excavates galleries of burrows similar in general plan but naturally of less diameter. The gribble is not a fast mover, but crawls leisurely about on its seven pairs of short legs. In form, the pest is not unlike a miniature of the common woodlouse or slater of our suburban gardens, to which it is related as a member of the group Isopoda. The head bears shorter antennae in comparison to those of *Chelura*, and at the end of the similarly segmented body is a broad tail-plate (telson). Neither *Chelura* nor the gribble are habitual swimmers, although they both have the necessary appendages to propel themselves through the water. The majority of the activities of each may be said to be almost confined to the immediate vicinity of their individual burrows in a piece of timber, in which they propagate generation after generation until enormous quantities are congregated together in the one area of attack. As a consequence of this we find sections of



The associate of Chelura in its work of destruction is the well-known gribble (Limnoria lignorum , an Isopod crustacean related to the common woodlouse.
[*Joyce K. Allan*, del.

structures exhibiting intense attack, while at a little distance away sound timber may often be found. Where the pests are present, however, all sound timber must sooner or later receive their attention, for their onslaught is relentless, carried on during every hour and minute throughout every day; this destruction man must seek to prevent during the working period of a day far shorter than that of the active pests.

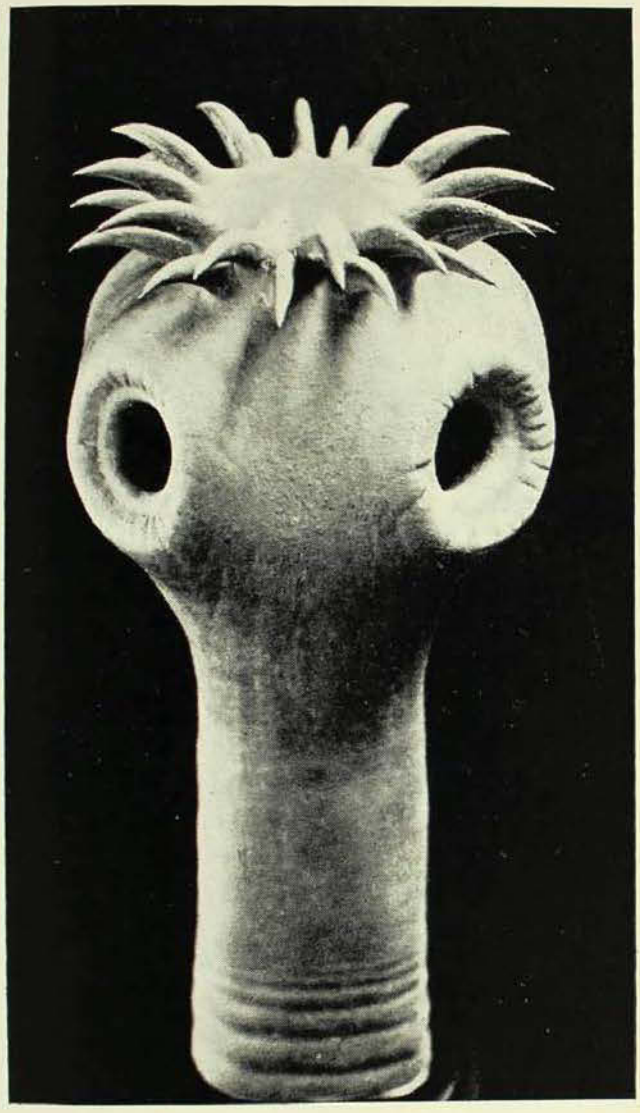
Two other much larger crustaceans are recognisable as potential pests in the port of Sydney. They have a superficial resemblance to their near relative the gribble, but quite impartially attack either timber or stone. These Pill-bugs (*Sphaeroma quoyana* and *Sph. terebrans*) are closely allied species, and about the size of the terrestrial wood-louse mentioned above. Their popular name is derived from their habit of drawing their bodies up into a ball when disturbed. When attacking, the pill-bugs usually commence operations in some depression, crevice, or other fault in a structure, and eventually they form galleries of burrows similar to those of their relatives. In timber at least, these large borers rarely make an initial attack, being seemingly content to shelter amongst marine growths such as the empty shells of dead barnacles, or embed themselves in the honeycombed woody fibres of the structures destroyed by the gribble and its ally. The slightest fault, however, is immediately taken advantage of, so that only the very soundest timber is proof for any extended period against attack. The fact that the pill-bugs are adept swimmers no doubt accounts for their very wide dispersion throughout the harbour, and is probably one explanation for their often common occurrence on structures they are not attacking.

Two different modes of breeding may be recognized amongst crustacean borers. The eggs of the isopodan forms *Limnoria* and *Sphaeroma* are carried and incubated on the underside of the abdomen. The first-named has very large eggs in comparison to its size, and these aggregate only about fifteen. When the young are released they are very active and almost immediately fend for themselves, disdaining the parental care which is bestowed upon the very numerous young of the pill-bugs (*Sphaeroma*). After hatching, the latter shelter for a considerable period around the bases of the legs of the parent. *Chelura*, on the other hand, deposits its eggs in conformity with the mode more characteristic of the members of its group (Amphipoda). With the aid of a magnifying glass caches of eggs to a total of three or four may be discovered amongst the labyrinth of *Chelura* burrows, but what the young look like when they are released and their immediate subsequent actions still remains unknown.

Many methods of prevention and destruction of marine pests have been suggested and put into practice, but only with partial success. Thus covering of wharf piles with metal was at first regarded as a specific, but later these copper and bronze compounds were found to suffer from erosion by sea-water, so that the pests were able to enter. A method which is giving moderate service in the northern hemisphere is the use of creosote, but this is not available to us. The creosote is forced into the wood by intense hydraulic pressure and the impregnated timber is found to defy the attacking molluscs and crustaceans. After some years, however, the effect wears off through the cleansing qualities of the sea water in its action on the impregnated wood. Unfortunately, the hard nature of the best Australian timbers available for wharf structures makes it impossible to force any poisonous chemical into their substance, and we are forced to rely only on their comparative resisting qualities. Another method of pest destruction resorted to with questionable results was the poisoning of small areas of water, but even a trial of this would be impracticable in this port with its miles of continuous wharfage structures. Protecting partially affected piles with cloaks of concrete in the form of a casing has been recommended, and is being carried out by the engineers of the Sydney Harbour Trust. An obvious deterrent to the pests is presented by this method, but it is probable that in time the concrete will disintegrate under the action of sea water and destruction will again proceed.

An Unwelcome Guest of Man.

By W. Boardman.



Greatly enlarged model of head of the tape-worm (Taenia solium). For purpose of illustration the unsegmented neck region has been considerably shortened.
[Photo.—*G. C. Clutton.*

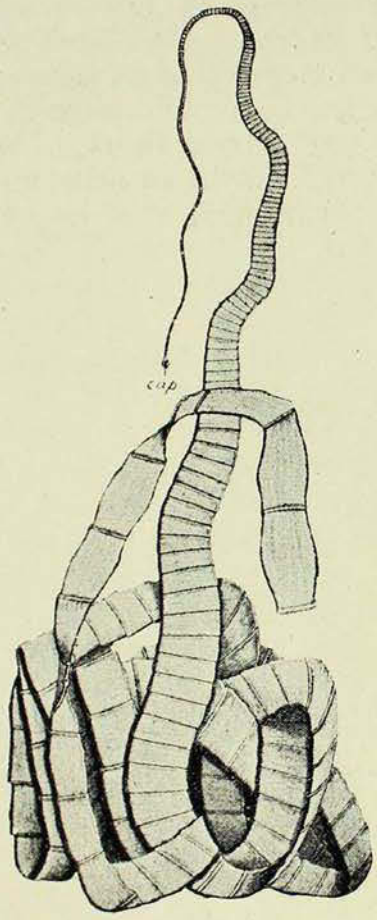
THE various cavities and channels of the human body harbour a motley assemblage of animal life. For instance, minute organisms jostle the corpuscles of the blood stream, whilst a host of forms, many of which are in reality veritable pirates, infest the food canal. One of these is the tape-worm, habitually resident in the lower part of the canal.

Whoever first compared this strange creature to a length of tape had a good sense of simile. Imagine a segmented worm, five, nine, perhaps twelve feet long, flattened like a piece of ordinary three-eighths inch tape narrowing at one end to a thread-like neck, the neck bearing at its extremity a knob about the size of the head of a pin which is spoken of as the "head." This "head," however, is not a head within the usual meaning of the term (some scientists have even gone so far as to suggest that it is really the posterior extremity), but is the organ to which has been allotted the very important function of anchoring the worm to the wall of the intestine. The necessity for this is patent when it is realised that the body of the tape-worm is continually trailing in a steadily flowing mass of digested food, against which it can offer no adequate resistance. Let us examine this head part more closely. The illustration depicts a model of one skilfully executed by Mr. J. Kingsley of the Museum staff and now displayed in the Invertebrate Gallery. The most conspicuous feature about it is the suckers, which, four in number, are arranged at about equal distances round the head. The earliest investigators described them as eyes but there is no justification for this view; they are suckers simply, having no connexion with the interior of the body and serving no other function than to assist the spines of the head to maintain a hold. These last are arranged in the manner of a double circlet sitting like a crown on the top of the head, and are capable of being elevated upward and backward until their extremities almost meet.

When in this position little urging from the suckers is required to force them like a minute skewer into the lining or epithelium of the food canal, when they open out umbrella-wise within the living tissue, and thus an extremely firm hold is secured.

The tape-worm is a parasite and therefore we expect to find evidence of degeneration such as is the hall-mark of the parasitic life. It is amazing to observe the extent of this in the body of the tape-worm. First of all the muscular system is so poorly developed in comparison with the mass of the body that, but for its head anchor, it

could not withstand the food current. And so totally unfitted has the body become for any other environment, that, should its host die, then it too, like the vassal of an ancient king, goes to the grave. Moreover, the tapeworm has no mouth, no stomach, no intestine, in fact no digestive mechanism whatever. Does it not seem remarkable that a creature thus constituted should exist without organs generally regarded as



The adult tape-worm (Taenia solium). Note the comparative smallness of the head (cap.) depending from the long thread-like neck.
(After Leuckart.

indispensable ? At first sight, yes. Yet after all there is no need for digestive apparatus, since the body is continually immersed in food already digested by the host. A mouth is absent because another method of taking the food into the body is employed, namely, by the provision of numerous pores scattered over the surface of the body, through which the food is absorbed.

The very conditions, however, which in the above-mentioned directions have brought about a degenerate state, have been responsible for a somewhat intense specialisation in another. I refer to the reproductive system, and particularly to the means whereby the eggs are disseminated. Tape-worms, like other parasites, are confronted with the solution of what is in reality an immensely difficult problem. This is the infection of new hosts. The tape-worm solves this problem in the following manner.

In describing the tape-worm's body, mention was made of its segmented structure (the average number of segments is approximately 850). Following down from the neck, segments are at first only faintly indicated, becoming more and more distinct further down the body. Each segment after about the 250th contains a complete rudimentary set of male and female organs, but it is only toward the 600th that these become fully developed and productive. In the segments right at the end the generative organs, having justified their presence, atrophy, leaving the segments little more than capsules of eggs. These "ripe" segments as they are called, drop off into the tract and ultimately reach the exterior. The discharged segment then breaks down, and the contained embryos, each provided with six hooks, are exposed to the light of day and commence their hazardous journey to maturity. Die they must unless Providence favours them by causing them to be taken into the body of a pig per medium of its food. Arrived in the pig's food canal the embryo bores its way through the wall by means of its hooks and establishes itself in the muscles. Here it rapidly develops into a form of greatly increased size known as the bladder worm. The bladder depends by a short neck from a complete tape-worm head, which in the earlier stages is invaginated within the vesicle as the fingers of a glove sometimes become when the hand is withdrawn from it. Later the head assumes the external position. This bladder worm stage marks the termination of development within the pig, for it is but an intermediate state which does not proceed further unless it is introduced into the body of man. Ample opportunity is provided for this when, as often happens, the pig is slaughtered for human consumption. Just how matters proceed after that depends on the temperature at which the flesh is cooked and the amount of cooking it receives. If underdone, the pork is served with its contained bladder worms still alive, and, though the structure may be damaged during mastication, it

is only necessary for the head portion to reach the food tract. When this happens there is a possibility that it will pass through the body without establishing itself, but generally the little head does not fail to secure a hold. Then segments commence to bud off from the neck, and in a remarkably short time the worm approaches the prodigious size of its parent, and in its turn launches numerous embryos, the majority of which undoubtedly, as in most of the lower forms of life, never attain maturity.

Several species of tape-worms have been observed in human beings in Australia, but they are by no means as prevalent as in many other parts of the world.

Much has been written concerning the ill effects resultant upon the presence of one or more tape-worms in the human body. In the species *Taenia solium*, to which the above remarks refer, these are not very conspicuous, and little trouble is generally experienced beyond a varying degree of intestinal irritation. When, however, it happens that man is the intermediate host for a tape-worm found mature in some other creature there is a different story to tell. The intermediate or bladder worm stage causes him to be afflicted with what is popularly known as hydatids, a malady frequently attended with fatal results.

It is well-known that certain sects abstain from eating pork, and the ancient Mosaic law was very explicit in its instructions for avoidance. Had the ancients' knowledge of tape-worm anything to do with this? We wonder.

Notes and News.

By the death of Mr. George A. Taylor on January 20th, the community has been deprived of one who strove hard for its advancement. An engineer with a keen inventive faculty he had many achievements to his credit, and he had also the distinction of founding the Wireless Institute, the first of its kind in the Empire. A few years ago he presented £5 5s. as a prize for the best essay by a school-child on a visit to the Australian Museum, an act which furthered the interest of juveniles in this Museum.

Through the kind offices of Mr. H. A. Longman, F.L.S., C.M.Z.S., Director of the Queensland Museum, and the cordial assistance of Mr. W. W. McCullough of the Yarrabah Mission, Cairns, a find dugong (*Halicore dugong*) was obtained on the Queensland coast, and forwarded to the Museum in the freezing chamber of the S.S. *Bombala*. We are greatly indebted to these gentlemen, to Howard Smith Limited, who generously carried the animal free of cost, and to Messrs. Cummins and Campbell, Ltd., Cairns, who made the necessary arrangements. A cast has now been prepared and will later be exhibited in the front hall.

From Mr. G. A. V. Stanley, B.Sc., Department of Geography, University of Sydney, we have obtained by gift an interesting collection of ethnological objects from Rennell Island. This little island which lies south west of the Solomons, has very seldom been visited by white men, and we had previously very little material from there, so that Mr. Stanley's donation is particularly welcome.

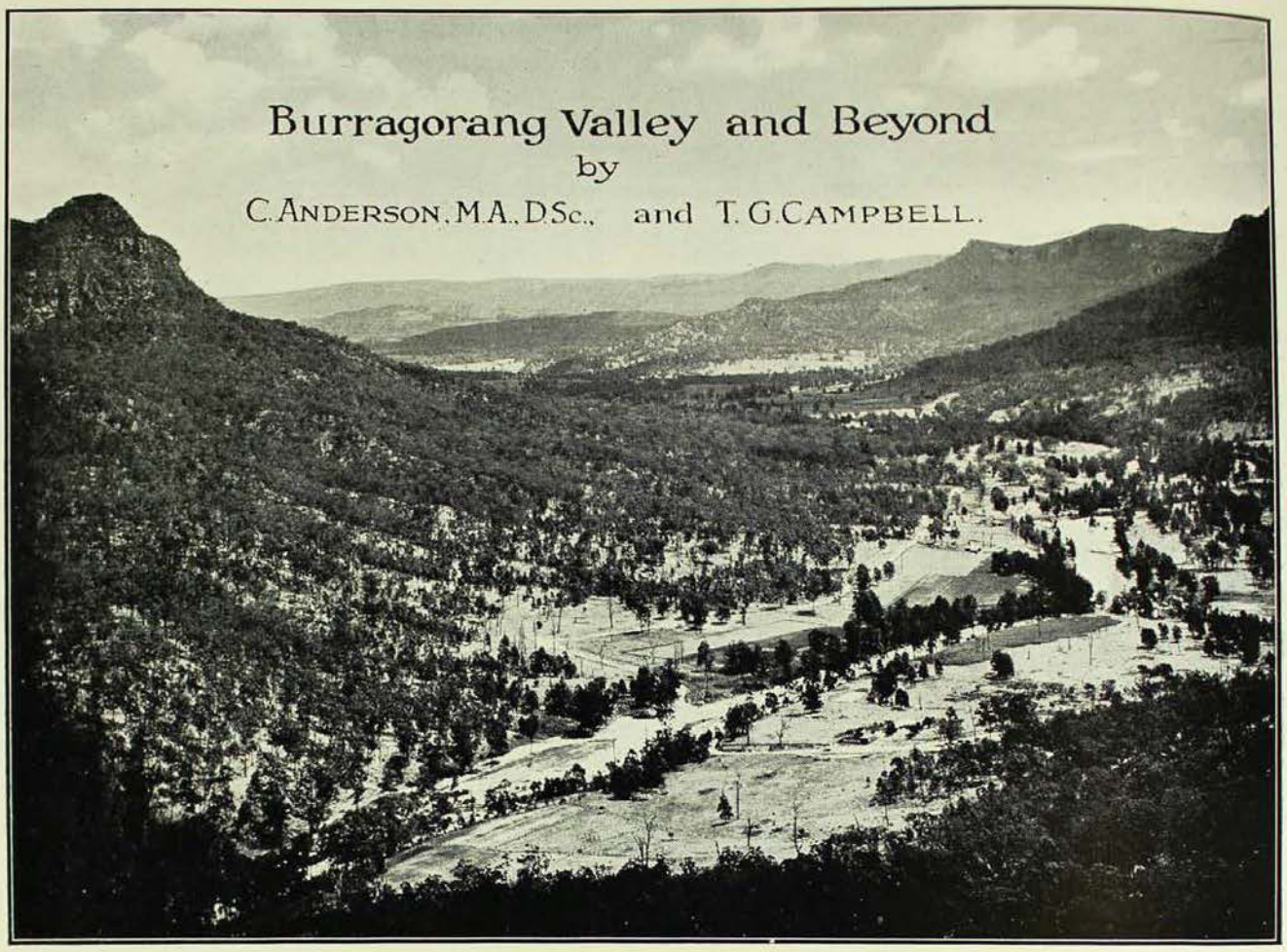
Mr. C. T. MacNamara, who is stationed in the Mt. Lamington district, New Guinea, is an active collector, from whom we receive many valuable specimens. Recently Mr. MacNamara has forwarded an exceedingly interesting series of marsupials, rodents, and bats, many of which were not previously represented in the Museum collection.

Professor T. Thomson Flynn, D.Sc., University of Tasmania, is at present engaged in research work at the Museum.

Burragorang Valley and Beyond

by

C. ANDERSON, M.A., D.Sc., and T. G. CAMPBELL.



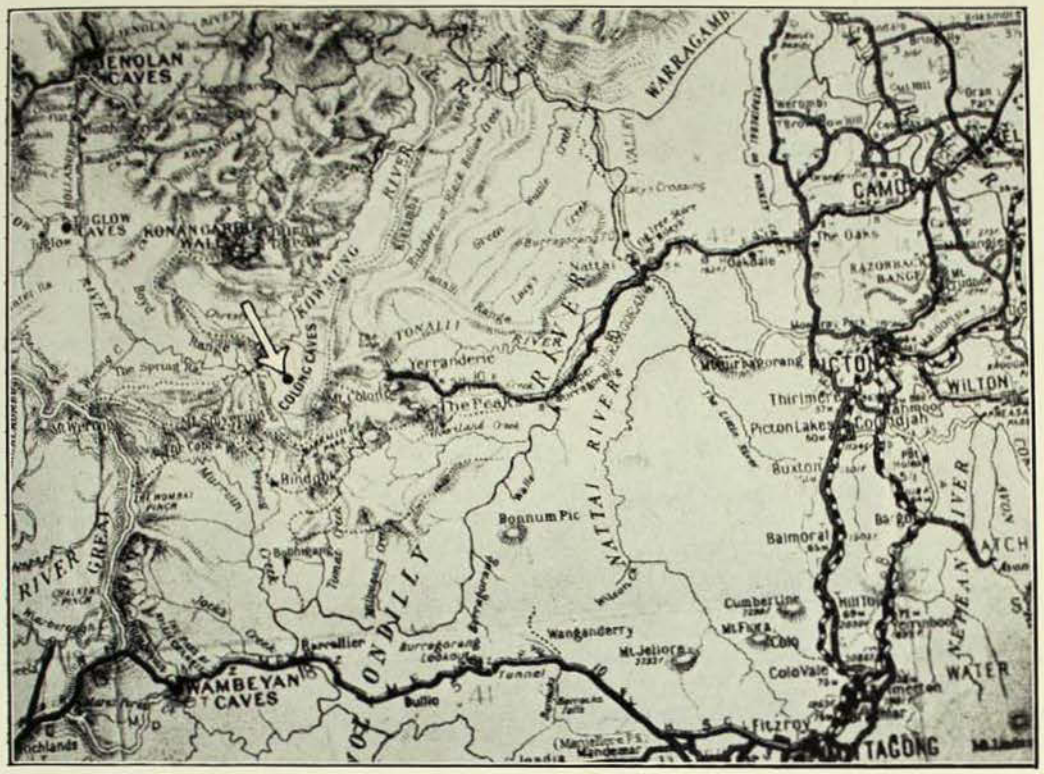
Burragorang Valley, where the Nattai (on the left) joins the Wollondilly.
Photo.—*A. Musgrave.*

RECENTLY two short visits were made by Museum parties to the Colong district, chiefly in order to obtain material for the construction of a kangaroo group. Colong is only about ninety miles from Sydney, but the rugged nature of the district has not encouraged settlement so that much of the country is still in a primeval state, and kangaroos, wallabies, and other members of our fast disappearing marsupial fauna are still fairly plentiful.

We travelled to Colong per motor via Camden and the picturesque Burragorang Valley, which has been described as an artist's paradise. A few miles beyond the little township of The Oaks, the road winds steeply downward to the bed of the Nattai Creek, which joins the Wollondilly a few hundred yards lower down. Both the Nattai and the Wollondilly have cut deep gorges through the Hawkesbury sandstone into the softer Permo-Carboniferous beds below, the sandstone forming bold escarpments, whilst the underlying rocks present steep slopes leading down to the alluvial flats bordering the stream. The river banks are lined with stately gums and river oaks, and on the flats are smiling farms and orchards where corn and fruit trees thrive admirably and pig-rearing is a profitable industry. These flats were once great gathering grounds of the aboriginal tribes, even those of Goulburn and the Shoalhaven participating.

Crossing the Nattai and the Wollondilly we proceeded up the valley until within a few miles of the silver-mining township of Yerranderie, where we left the main road and plunged into the bush, following the stock route to Colong, a rough track with very steep grades and many sharp turns exceedingly trying to the nerves and the temper of the motorist. Our first trip was made in mid-winter, and night had fallen before we reached the turn off, so that the last seven miles had to be traversed in the dark, an experience not soon forgotten.

Our party, consisting of Anderson, Campbell, and Wright, arrived at Colong home-



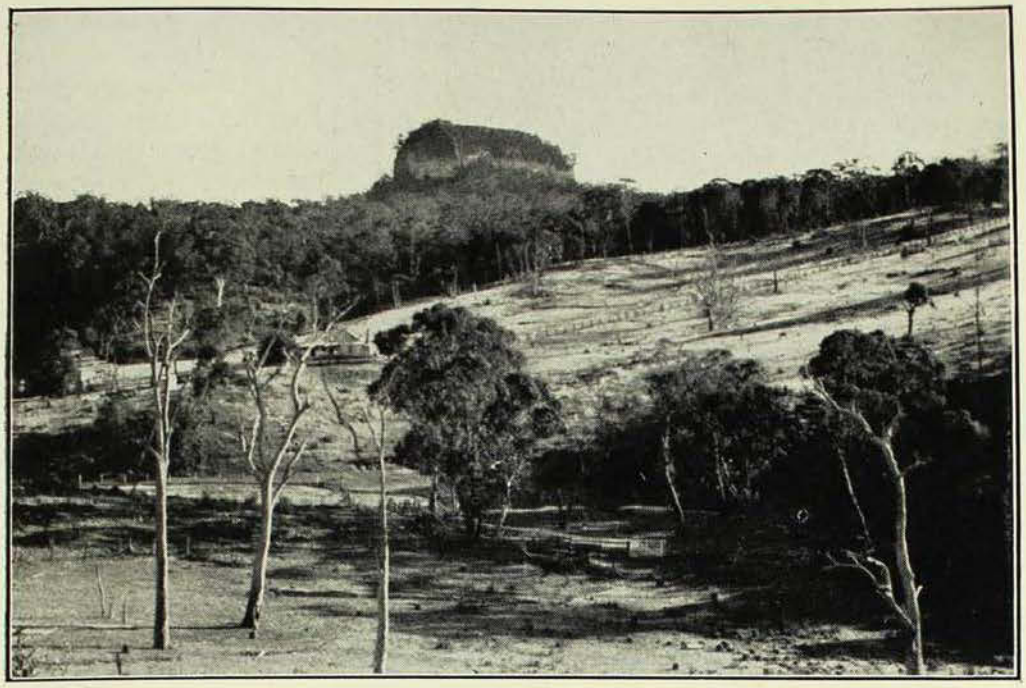
Colong and the surrounding country.

stead about half-past seven, cold, tired and hungry, but our gloom was soon dispelled by the warm welcome we received from Mr. H. N. Patton, the caretaker, and his two sons. By the kindness of Mr. John Moore, owner of Colong Station, we were able to make the homestead our headquarters on our two visits, and from Mr. Patton and his boys we received much kindness and help. Their intimate knowledge of the country was of the greatest assistance to us, and through their aid, our collecting work was much more successful than it otherwise would have been.

HISTORICAL.

The first white man to penetrate the wild Colong country was Ensign Francis Luis Barrallier, an officer of the New South Wales Corps, who, in 1802, made a gallant attempt to cross the Great Divide separating the coastal plains from the unknown interior. As shown by Mr. R. H. Cambage, a Trustee of this Museum, who has traced the course of this early explorer, Barrallier came very close to success. In his first trip he started from Parramatta, and, following much the same route as ourselves so much later, he crossed the Nepean in the neighbourhood of Camden and reached the Nattai gorge, where he made a depot. Pushing on, he crossed the Wollondilly and followed its valley to Yerranderie. Meeting hostile tribes he returned to his base on the Nattai, but, after a short rest, he again set out and this time he passed through a gap in the Yerranderie hills and reached Colong Creek close to the spot where the homestead now stands. Keeping a

On the road to Colong Caves, looking north west across to the Boyd Range.
[Photo.—*A. Musgrave.*



The Little Rick, 2,500 feet, an isolated sandstone mass, forms a striking landmark. Colong Homestead in the middle distance.

[Photo.—*A. Musgrave.*

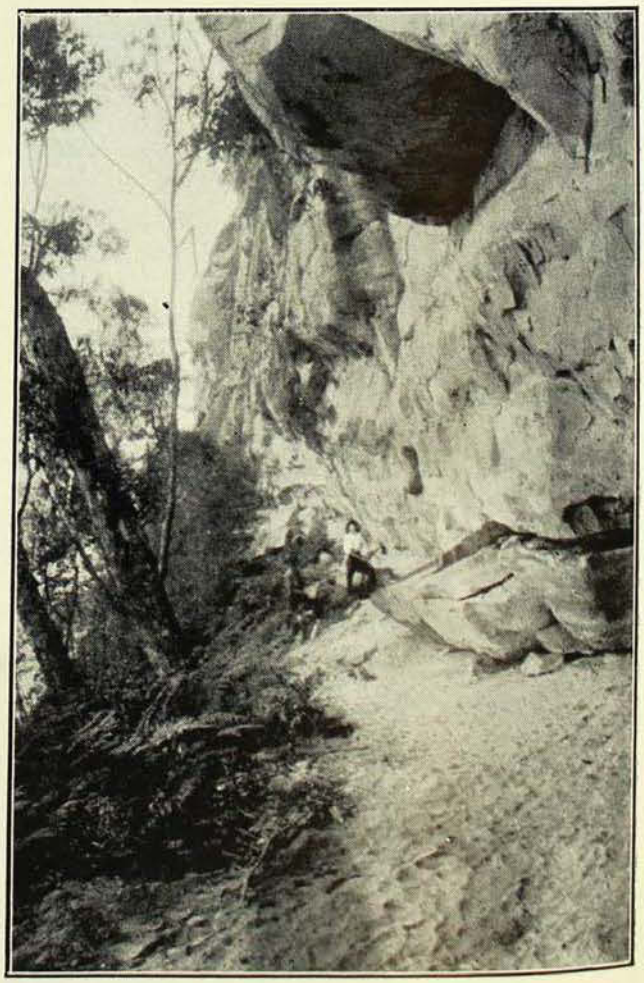
westerly course he crossed the ranges through a gap now called Barrallier's Pass and reached Bindook Creek. Here, however, his progress was barred by precipitous cliffs, and, turning to the north, he ultimately came to the Kowmung River which he followed to Christy's Creek. He then turned west up Christy's Creek, but once more he was stopped by a waterfall and rugged cliffs. Being short of provisions he decided to retrace his steps when about twenty miles south of the Jenolan Caves.

The first settlement in this picturesque locality was made over sixty years ago by the three brothers Moore, who at first engaged in the capture and shooting of the wild horses and cattle which then roamed the district. Colong is still the only station, but, if the district were made more accessible, there is no doubt that it would produce a considerable amount of wool and beef.

TOPOGRAPHY.

The homestead is situated in a valley through which winds Colong Creek. It is surrounded by hilly country, heavily timbered for the most part, and intersected by gullies alternating with ridges strewn with splintered rock, and sometimes ending in precipitous slopes plunging down to deep rock-ribbed gorges. Geologically the district is composed mainly of Hawkesbury sandstone, with a few outcrops of igneous rock, and the topography is that of a deeply dissected plateau of practically horizontal sediments. In fact the scenery is of the same type as is found on a grander scale in the Blue Mountain area, of which the Colong district is a south westerly extension.

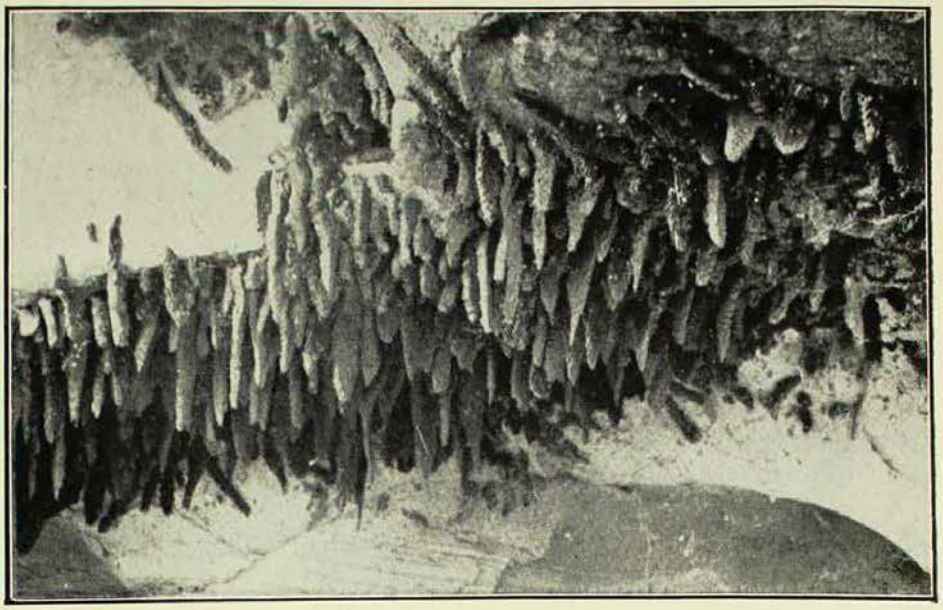
One of the most striking features of the landscape is the Little Rick, an outlier from the main range consisting of a huge rock mass with



The walls of the Little Rick in places overhang the base.

[Photo.—*C. Anderson.*

precipitous or even overhanging walls, which rise to a height of about two hundred feet from the talus slope at the base. It is the denuded remnant of a long ridge, and now forms a narrow mesa measuring about half a mile along the base. Seen from a distance the Rick resembles a battleship floating on the foliage, its prow pointing southward. So steep are the walls that no one has been able to scale them, and, unlike the plateau in Conan Doyle's "Lost World," it has no convenient cliff nearby whence it can be reached by means of a fallen tree trunk. The top is comparatively flat and is sparsely covered with stunted gums. The walls are honeycombed at the base with cave-like openings and rock shelters, where the cliffs have been undermined by frost and other atmospheric agencies. These shelters are the haunts of numerous animals, which have left their footprints in the soft sand. We examined these "pads" with great interest, and were able to recognize those of wombats, wallabies, native cats, foxes, rats, and mice, which no doubt find in the caves and fissures a welcome retreat during inclement weather. In one of these rock shelters we discovered the large nest of a social wasp (*Rhopalidia*).



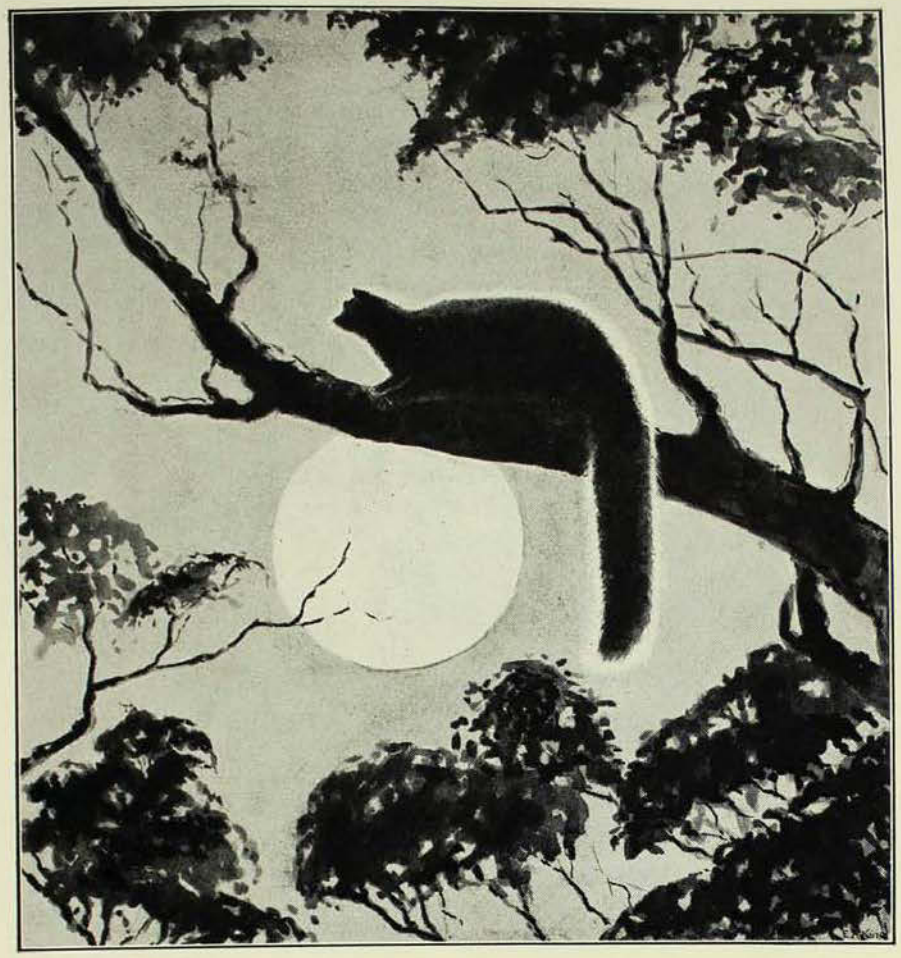
Community of Paper-nest Wasp (Rhopalidia.)
[Photo.—*T. G. Campbell.*

DAY AND NIGHT-HUNTING.

Our first night at Colong was cold, wet, and depressing, but the morning broke fine and sunny, and we were early astir and out on the hills. Every day for the next fortnight we tramped the country, ever on the lookout for kangaroo and wallaby, not to speak of birds and smaller game, such as lizards and insects. When on the lookout for game one is apt to neglect the precaution of picking out landmarks to serve as guides on the return journey and it is easy to get lost in the maze of ridges and gullies. More than once we found ourselves "bushed." On one occasion, when making homewards after a hard day, we were astray for about two hours, and were resigning ourselves to a night in the open, without blankets, food, or water, when one of the party stumbled on a path which led in the right direction. Not long ago, near the same spot, a party of four started out after kangaroos before breakfast on a Saturday morning. They quickly lost their bearings, and it was not until the following Tuesday afternoon that, famished and despairing, they were found by a search party.

After a successful day's collecting a considerable amount of work had to be done in skinning our catch, preparing the skins and skeletons, labelling, and entering up the necessary data concerning the specimens. Then traps had to be visited, cleared, and reset. We set out a line of traps along the creek, and here we caught a number of small mammals, including a fine specimen of a Marsupial Mouse (*Phascogale flavipes*). One morning Lawrie Patton was surprised to find a tiger cat (*Dasyurus maculatus*), a scarred and battered veteran, caught in a rabbit trap. We kept him alive for some days, and a crossgrained captive he was, always ready to attack anyone who approached him. But our greatest success with the traps was along the base of the Rick and at the Colong Caves, where we collected several bush rats.

After dinner we sallied forth once more, equipped for night hunting, and sometimes we did not return until well after midnight. Many marsupials are nocturnal, and special methods must be employed to secure them. The moon was near the full when we arrived,

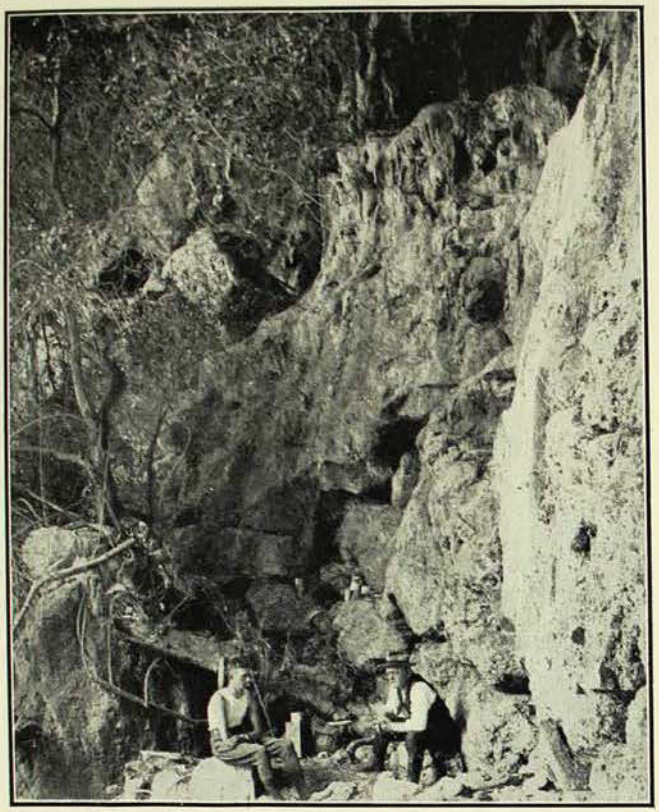


"Mooned." The Taguan Flying Phalanger (Petauroides volans). The moon's rays outline the animal with a silvery aureole.
[Drawn by *Miss E. King* from field sketch and photograph.

and during our first visit we enjoyed a succession of almost cloudless nights, with scarcely enough wind to rustle the strips of dry bark hanging on the gum trees. The air was crystal clear, with a touch of frost, and the slightest sounds seemed to be magnified in the velvety stillness of the night; now it was the furry flight of an owl, again the weird cry of the Boobook Owl, the mournful "oom-oom" of the frogmouth, or the staccato bark of a fox.

In our night excursions we encountered many Taguan Flying Phalangers (*Petauroides volans*), beautiful creatures with silky black fur on the back, a white undersurface, and a long bushy tail. Stretching along its flanks between its fore and hind limbs, is a parachute-like expanse of skin, by the aid of which it makes long swoops from tree to tree. They were generally high up in tall gums, and, as we directed our search-lights on them, the animals would turn to examine the disturbing radiance, their large eyes glowing by reflection like small electric lamps. By "mooning" them we were able to observe the animals, ourselves unseen; this is done by taking a position so that the creature is in a line with the moon. Secure on its lofty perch, the animal would sit quietly performing its toilet, or would move leisurely along the branch. One of our party was fortunate enough to see one volplaning on to a stump, which it quickly ascended, to pose on the top like a statue. These animals have rather poor fur, and their skin, like that of most flying animals, is thin, so that their pelts have but little value. Consequently these animals are not molested by skin hunters, and, as they have few natural enemies, they are perhaps more abundant in forest country than any other marsupial. It is otherwise with the Common Opossum (*Trichosurus vulpecula*), and the Ring-tail (*Pseudochirus laniginosus*), the skins of which are more valuable; these animals, especially the former, are now very scarce where once they were abundant. We saw several Ringtails, but not one Common Opossum. The pretty little Flying Squirrel (*Petaurus breviceps*), too, was scarce, though we saw a few on our nocturnal rambles.

At night kangaroos, the Great Grey (*Macropus giganteus*) and the Wallaroo (*Macropus robustus*), came down to feed in the valley, and now and then we disturbed little groups of these wary animals. Usually they discovered us, and the first intimation we had of their presence was a flurry and rustle, followed by the "thud-thud" of flying feet as they bounded off, their long leaps soon carrying them out of range, though we were able to secure some fine specimens for the collection.



The Arch Cave, where the parties camped amid fallen limestone boulders.

[Photo.—*A. Musgrave.*

THE COLONG CAVES.*

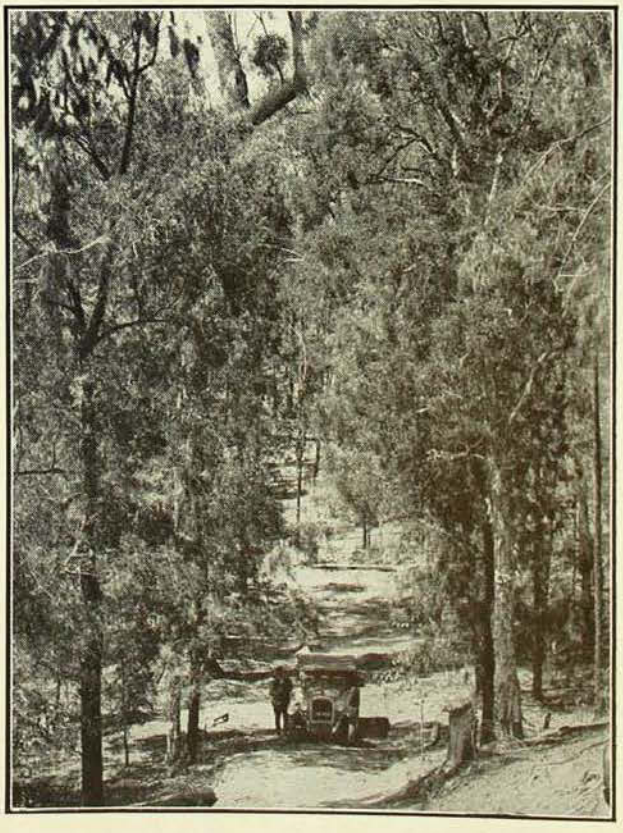
We decided to pay a visit to the Colong Caves, distant about seven miles, chiefly in the hope of capturing some of the bats which have their homes there. We set out early in the morning, Lawrie Patton, leading a packhorse, accompanying us as guide. As we were to spend a night at the Caves many blankets were necessary, as well as cooking utensils, food supplies, firearms, and collecting gear.

Our way led past the Rick, along Colong Swamp and up a wooded valley filled with untidy paper-bark trees. After we got into the ranges the track became rough and uneven, and we were exceedingly glad to reach the top, where we could look down on the narrow valley in which the Caves lie. From here we descended about a thousand feet, flushing on the way a Swamp Wallaby (*Macropus ualabatus*), which was hiding on a bracken-covered hillside. That night, each perched on a rocky ledge, we camped in the Arch Cave, which has been laid open by denudation, and now forms part of the wall of the gorge, and the following morning we raided the bats. We were successful in finding a large colony, clinging in clusters to the roof, and scooped a number into a butterfly net.

The vegetation in the neighbourhood of the caves is more luxuriant than elsewhere in the district. Giant River Oaks (*Casuarina cunninghamii*) fringe the creek, and fig trees and myrtles hug the sides of the gorge. Climbing vines and various epiphytic plants cling to the branches of the trees, and a rank growth of nettles, of a particularly virulent type, gave us some very uncomfortable moments.

BIRD LIFE.

We were struck by the abundance and variety of bird life, especially during our second visit later in the year, when the party consisted of Anderson, Campbell, and Musgrave. Birds were particularly plentiful near the caves, for in this remote spot they are seldom disturbed by human visitors. We saw several species of tits (*Acanthiza*), hopping and twittering amongst the trees, as well as Diamond Birds, Rock Warblers, Wonga Pigeons, and several kinds of parrots, and cockatoos, including the brilliant Lowry,



The road to Colong, picturesque but difficult.

[Photo.—*A. Musgrave.*

*These caves are described by Mr. Cecil J. Barnes in this number (p. 212).

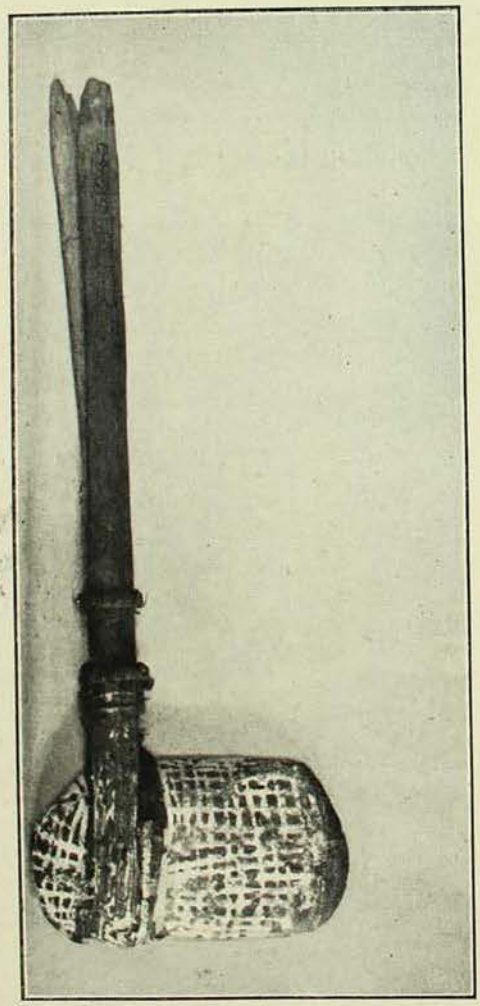
the Rosella, the Gang-Gang and the Black Cockatoo. In the open forest were small flocks of the White-winged Chough, fluttering and chasing one another among the branches. Rarely did we encounter the Satin Bower Bird or its bower, and, although in the thick scrub near the caves, we heard the musical call of the lyre bird, we were not successful in getting a view of this shy and elusive songster. Twice we encountered what we confidently believed to be the Squatter Pigeon (*Geophaps scripta*), a species which is now very rare and even thought to be extinct in New South Wales. Round the homestead came many friendly birds, such as the Wagtail, Scarlet-breasted Robin, Harmonious Thrush, and the perky little Blue Wren.

FROGS.

During our second visit we were serenaded nightly by the frog choir in the creek below the homestead. During the daytime not a single frog could be seen, for they were securely hidden amongst the reeds and water plants. But armed with torches we invaded their realm one night and captured a number as they hopped wildly along the banks.

Aboriginal Axes.

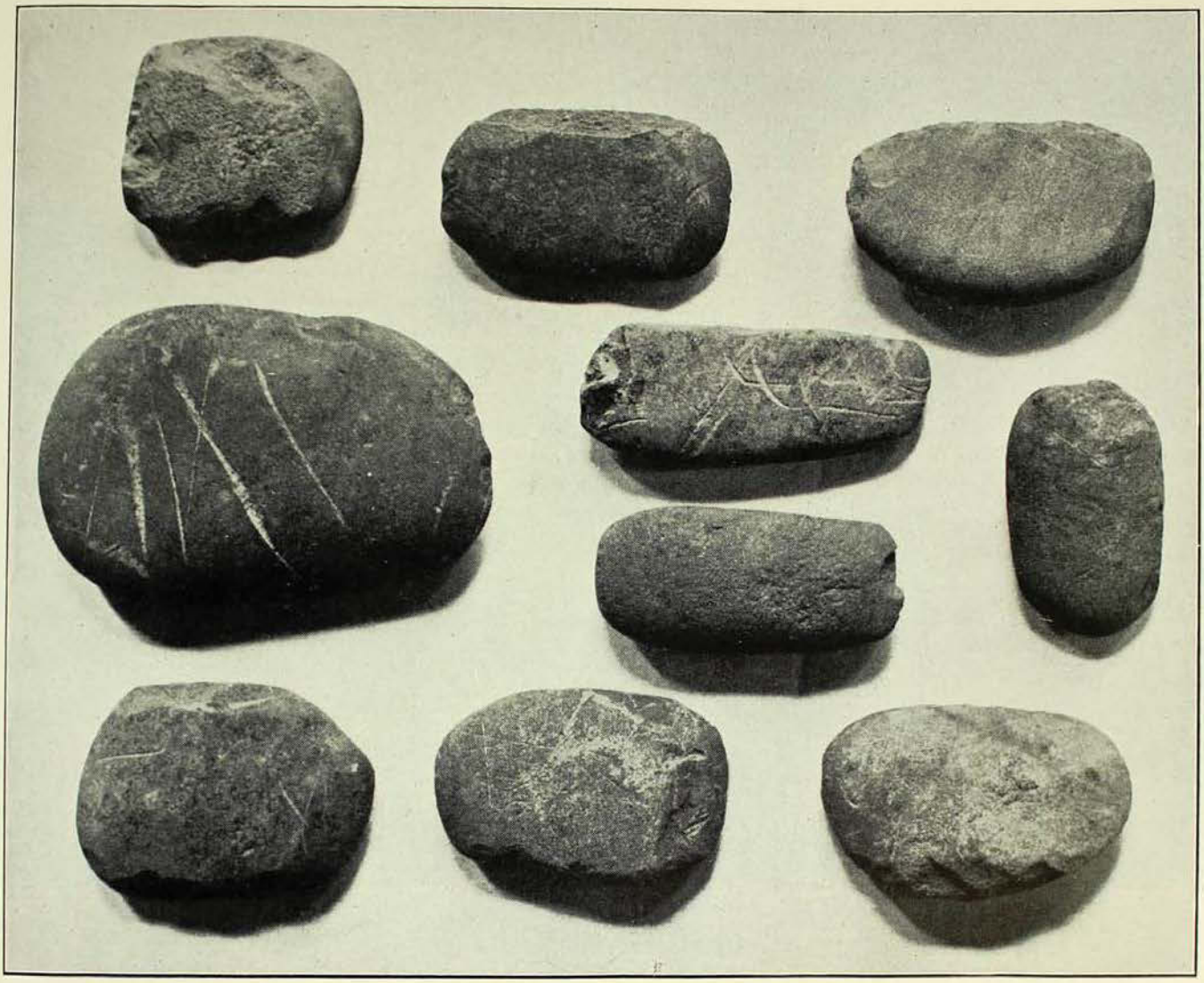
By W. W. Thorpe and M. S. Stanley.



Hafted Stone Axe, Roper River, North Australia.
[Photo.—*G. C. Clutton.*

If one walks along the banks of the Nepean with an observant eye, unsuspected relics of aboriginal handiwork, in the form of flakes and axes, may frequently be discovered. The same applies to the contiguous fields and orchards on Emu Plains, where, like the skulls of Blenheim, "the ploughshare turns them out." The axes shown in the plate above were picked up by two Museum friends on the orchard properties of Messrs. Broadbent, Chapman and Innes.

Stone axes, celts, or tomahawks, were in general use throughout Australia. There are several definite forms, governed by the material available, and the purpose for which they were made. Perhaps the most elementary is the improvised pebble-axe. These consist of waterworn pebbles, with a flake removed at one end to meet the curve of the stone on the opposite side, thereby producing a tolerably sharp cutting edge. The next stage would appear to be the pebble axe as illustrated above, where a bi-bevelled blade is produced by attrition. The quarried, flaked, and ground form follows, and represents a fairly high degree of technique. Another variety, with, however, a restricted occurrence, is the grooved axe. This type has a definite depression encircling it to accommodate a



Aboriginal Pebble-Axes from Emu Plains, Nepean Valley, New South Wales. Collected and presented to the Museum by Messrs. M. S. Stanley and G. E Bunyan.

[Photo.—*G. C. Clutton.*

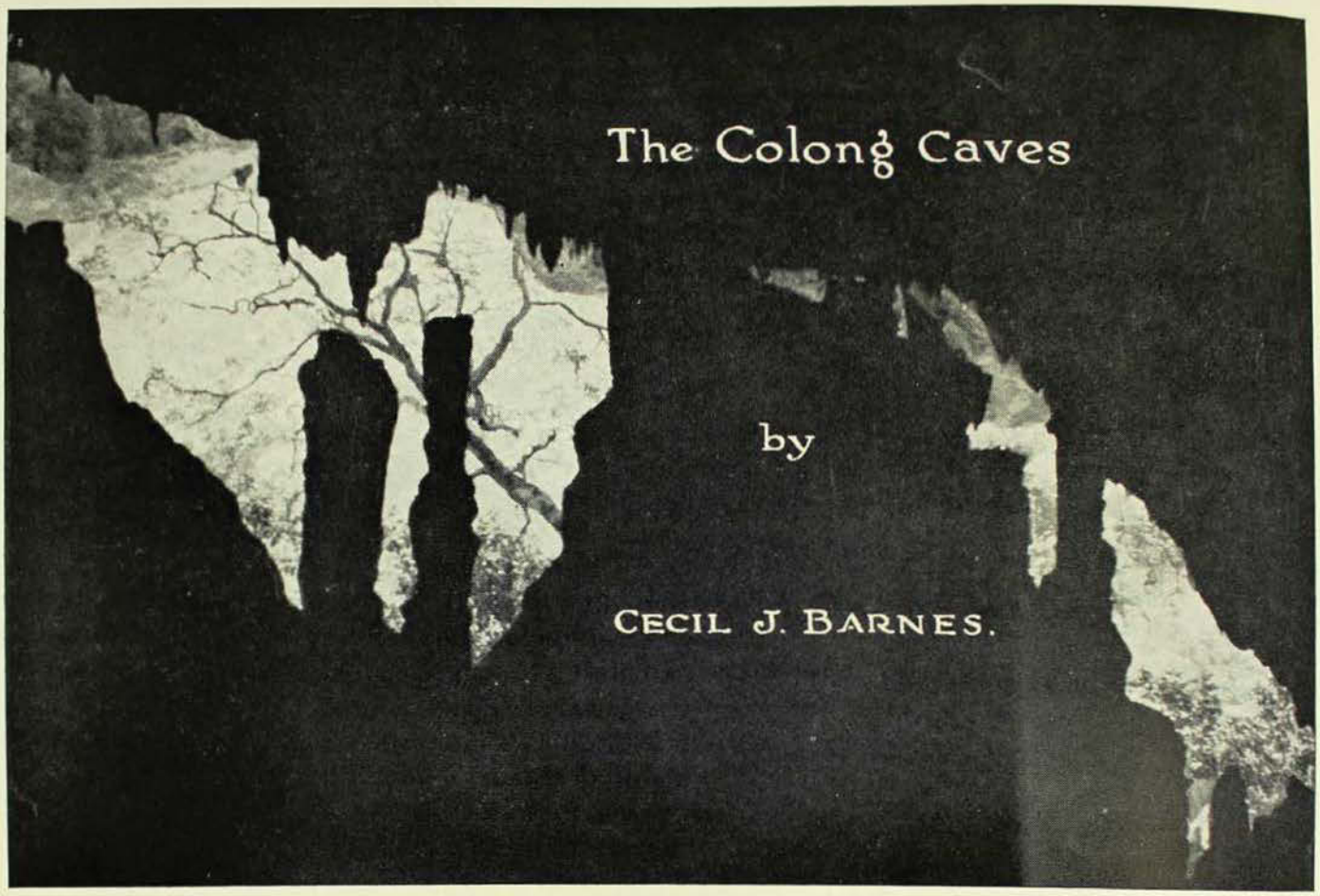
handle. The axe is hafted by means of a flexible lath or withy passed around the stone head and tied at intervals. This was often supplemented by gum cement, thus securing the head in a rigid manner. In Western Australia we find still another hafted form in which two pieces of stone are used, giving a double-headed appearance to the implement. A short stick forms the handle, which, with the two stones, is embedded in gum cement without any apparent binding.

The axe was more frequently used unhafted, the stone head being grasped by the hand of the operator.

Sometimes intentional depressions are to be seen about the centre of the stone on each side. These are referred to as "thumb and finger holes," but were more probably used for nut-husking, the axe head serving as an anvil.

All these crude implements would be of little use to a European. He would probably break the hafting at the first blow, but when we remember that the aboriginal usually cuts *with* the grain, and that the time factor does not count, the belief in their utility is more acceptable.

The stone axe was used for cutting and bruising, making foot-holes in trees to facilitate climbing, cutting apertures in logs to extract animals for food, and various other uses incidental to savage life.



The Faulted Pillars, Arch Cave.

[Photo.—*C. J. Barnes.*

LIMESTONE caves are numerous and extensive in New South Wales but very few groups are worthy of mention. The Colong group is, in my opinion, worthy of a description. Situated in the Parish of Colong, County of Westmoreland, it is accessible by a bridle track, leading eight miles westerly from Yerranderie, an old silver mining village. This track is of great scenic interest, no less than three very extensive panoramas being obtained as one crosses the Tonalli and Kowmung watersheds. The total distance from Sydney is about ninety miles.

The caves occur in a limestone belt of Silurian age. The outcrop is more or less continuous over a distance of five miles from the Mount Shivering Range to Church Creek. The limestone itself is about 500 feet wide and is very heavily folded, dipping about 80 degrees easterly and striking about 15 degrees East of North. Claystones occur on each side and the whole series resembles the Jenolan beds.

Fossil corals are numerous and bear witness to the origin of the limestone. No doubt it was formed as a barrier reef, contemporaneously with the Jenolan and Wombeyan deposits, just as we now find parallel reefs along the Queensland coast near Cairns. Since that time the limestone has undergone numerous oscillations, being sometimes beneath the sea, sometimes above it, receiving its covering of sediment from each age. Now it is laid bare to the elements, which in prehistoric times and even at the present moment carve out these wonders of Nature. Percolating water is the magic wand which turns this dull rock into gems, more exquisite than any work of man.

On the Underground River, Lannigan's Cave.

[Photo.—*C. J. Earnes.*

Barrallier, in 1802, whilst endeavouring to cross the main divide circled these caves and must have seen the limestone at the head of Lannigan or on Church Creek. No other early records exist, but the late C. R. Scrivener mapped Lannigan Creek in 1893, and mentions the limestone bluffs. Mr. Lannigan, who was a cattle man in these parts, was probably the discoverer of the caves, and his name is perpetuated in one of them and in Lannigan Creek. Mr. Oliver Trickett examined Lannigan's Cave in 1899, and made a report on it which resulted in the reservation for caves covering the whole belt. He suggested the name "Colong Caves," after Mount Colong, a large conspicuous mountain about a mile away. This name is derived from the native word *colung*, signifying the home of the bandicoot. The caves were also known as the Bindook Caves, after the locality to the south of the caves reservation.

DESCRIPTIVE.

The three main caves are situated above the Caves Creek on its left bank about seven chains above its junction with Lannigan Creek. The limestone scarp almost closes in the valley and undoubtedly did so in prehistoric times.

THE ARCH CAVE.

This is now a daylight cave and was formed when the limestone blocked the valley. It is about two hundred feet long and eighty feet wide, with its eastern entrance about eighty feet above the creek. It is very beautiful when seen by reflected sunlight, the roof giving a glorious range of greens, pinks and grays. The floor has subsided at its southern end, and four pillars, once joined, are now separated by about three feet from the roof. In silhouette these pillars are very imposing. At the

northern end there are several smaller stalagmites resembling crowned heads. Basin structure is also abundant, some of the basins containing the so-called "bird's eggs," which are small round pebbles formed as concretions in limestone.

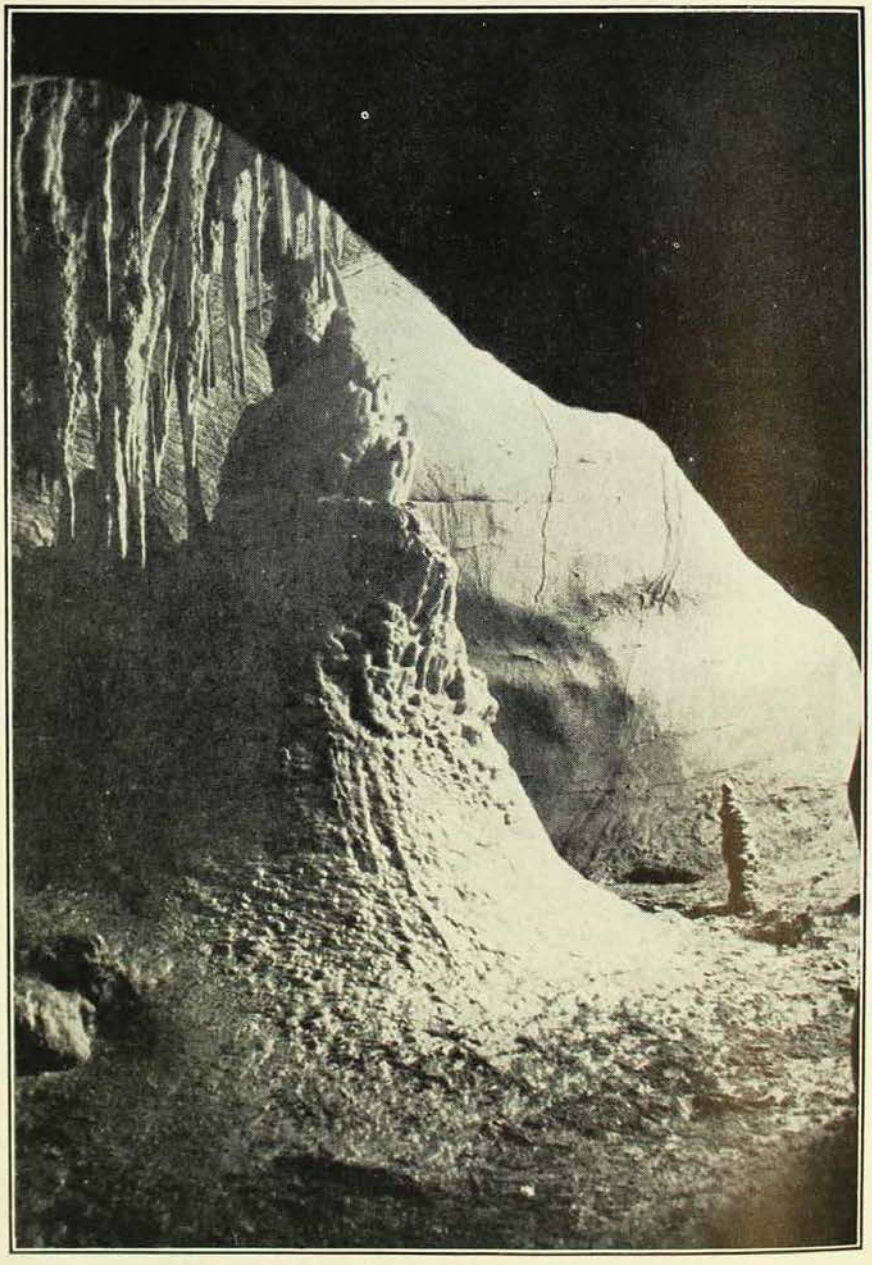
LANNIGAN'S CAVE.

Situated above the Arch Cave and about one hundred and fifty feet above the creek, a small opening leads down into this cave. Some very fine shapes are observed amongst the weathered formations, the most perfect being the group, The Torch and Candle, with a well grained and perfectly folded shawl.

A narrow squeeze-hole is then passed through and we arrive in King Solomon's Temple. This chamber contains five large fluted and terraced columns, almost forty feet high. Beneath one group of columns is the Altar, a crystalline amber-tinted stalagmite. Overhead is a white stalactitic group, making the whole scene impressive and inspiring. At the end of this chamber a small opening to the right leads to the Water Cave. Beyond description, this gem holds one entranced. Numerous stalagmites are observed in the bed of the underground river, the water of which appears to be of the faintest green. Beyond lies the Styx.

Retracing our steps, we climb over a wall of rock and approach the Terraces. These are a series of crystalline basins within white, frilled, and delicate rims, which become progressively larger as they approach the bottom. Looked at from below, they appear to be marble steps leading to the Showcase beyond. The column and stalactites on the left are very beautiful and give the impression of a curtain held back to show the stage setting beyond. The basins extend back for a distance of eighty feet and are eight feet wide at the bottom. A low passage to the right leads to the underground river channel, along which are some very beautiful and delicate formations. One grotto resembles a jewel show, the shawls on the ledges sparkling like diamonds. Some perfectly shaped pillars, of a delicate pink shade are found opposite these shawls. One pillar is complete with plinth and cornice. Another little grotto has a group of pure white stalactites like so many icicles.

A climb of twelve feet brings us to a narrow passage, decorated with tinted, crystalline stalactites, which shelter a ledge



The Crinoline, Lannigan's Cave.
[Photo.—*C. J. Barnes.*

The Terraces, Lannigan's Cave.
[Photo.—*R. O. Johnson.*

on which are numerous small delicate drip-stone growths ; this is known as the Show-case. Emerging from the passage, we reach the top of the Terraces.

A third passage from the end of King Solomon's Temple leading to the left, brings us to an amber-tinted, crystalline stalagmite, the Crinoline. It is surmounted by an attractive group of white stalactites. This passage connects by a squeeze-hole with the Onslow Cave, which eventually reaches daylight in the creek below the Arch Cave.

THE ONSLOW CAVE.

This cave is entered below the Arch Cave through a small opening about thirty feet above the creek. A tunnel-like passage, tenanted by bats, leads to the Shawl Chamber. Here one looks down on massive shawls, hanging about twelve feet down the wall, on which the crystals sparkle like jewels. The main cave is situated to the left, and access is obtained to it by a long narrow squeeze-hole. The effort is worth while, for the formations are abundant and beautiful. A cluster of tinted stalactites almost blocks the passage, and the floor here is covered with a petrified glacier. Next we meet the Fortified City, a miniature, the fortifications and battlements of which are formed of little terraces and basins. At the back is the Capitol, surmounting the city and beyond this a wall of rock. The soldiers are tiny stalagmites, like crab tracks on the sand. Alongside this is The Hot House, perhaps the most beautiful group in the Caves. Glistening shawls hang from the roof ; massive stalagmites, some terraced with a network of basins, resemble clipped shrubs, and, in the centre, is a perfect white stalagmite, the White Rose of York. This chamber is about two hundred feet long and is ornamented for the whole of its length with attractive shawls and stalactites.

A steep climb brings one to the Mysteries, a group of helictites and stalactites which adorn the wall of a small branch, otherwise bare. Its delicate structure, together with its wax-like appearance holds one in wonder

The Shawls, Onslow Cave.
[Photo.—*C. J Barnes.*

The Squeeze-Hole, Onslow Cave.

[Photo.—*R. O. Johnson.*

at the cleverness of Nature's handicraft. A squeeze-hole at the end leads to The Crinoline, in Lannigan's Cave.

OTHER CAVES.

About twenty chains south of the Arch Cave is the Coral Cave, ornamented with coral-like growths. Across the Caves Creek, high up in the bluff, is the Red Cave, which contains crystalline reddish and tinted formations. Half way along the limestone belt is the Mystery Cave, which contains a remarkable mystery formation, consisting of a network of sprays, oval in shape. At Church Creek, is the Lyttleton Cave, with weathered formations. There are also a number of unexplored caves here which will probably yield fine formations when explored.

In conclusion might I express a wish that at some not far distant day, a generous government will make this rugged area, the Kowmung watershed, a sanctuary for wild life? Its scenic wonders warrant its reservation, and its furry and feathered occupants claim it as their heritage. This reservation would be a worthy addition to our existing national parks.

Mr. Octavius C. Beale, F.R.S.L., F.R.H.S., Trustee, has recently returned from a prolonged trip abroad. We extend our congratulations to him on his election as a Fellow of the Royal Society of Literature.

During January, Dr. C. Anderson and Messrs. A. Musgrave and G. P. Whitley of the Museum staff attended the Hobart meeting of the Australasian Association for the Advancement of Science, and each contributed a paper to the Zoology section. They also took the opportunity to do some collecting, and brought back a number of mammals, reptiles, frogs, fishes, and invertebrates.