

The AUSTRALIAN MUSEUM MAGAZINE

Vol. VI, No. 5.

JANUARY-MARCH, 1937.

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The Elfin Wren.

THE AUSTRALIAN MUSEUM

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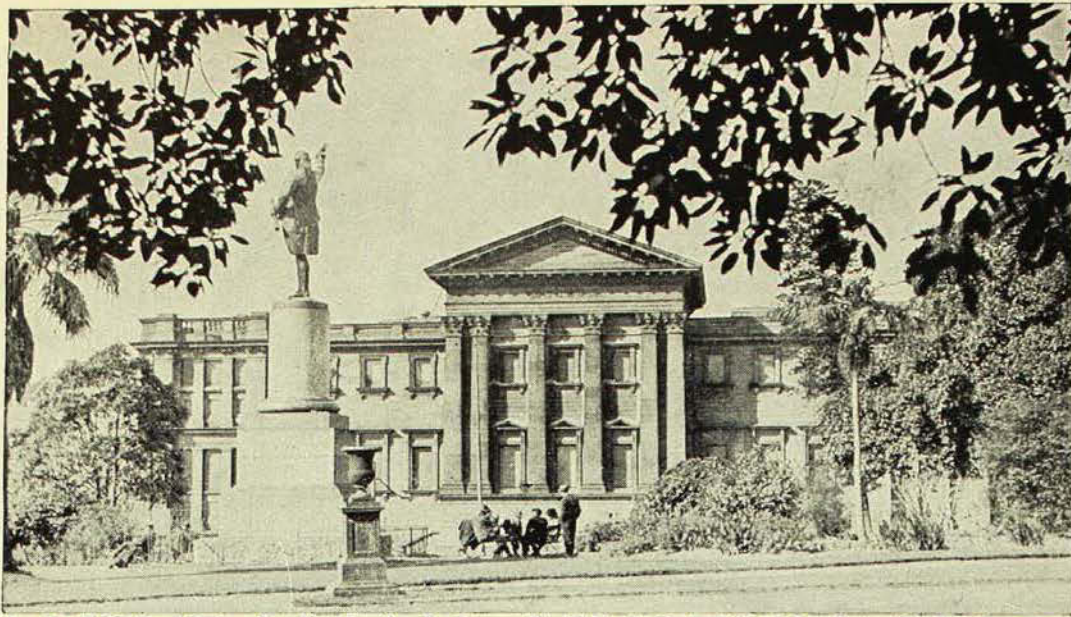
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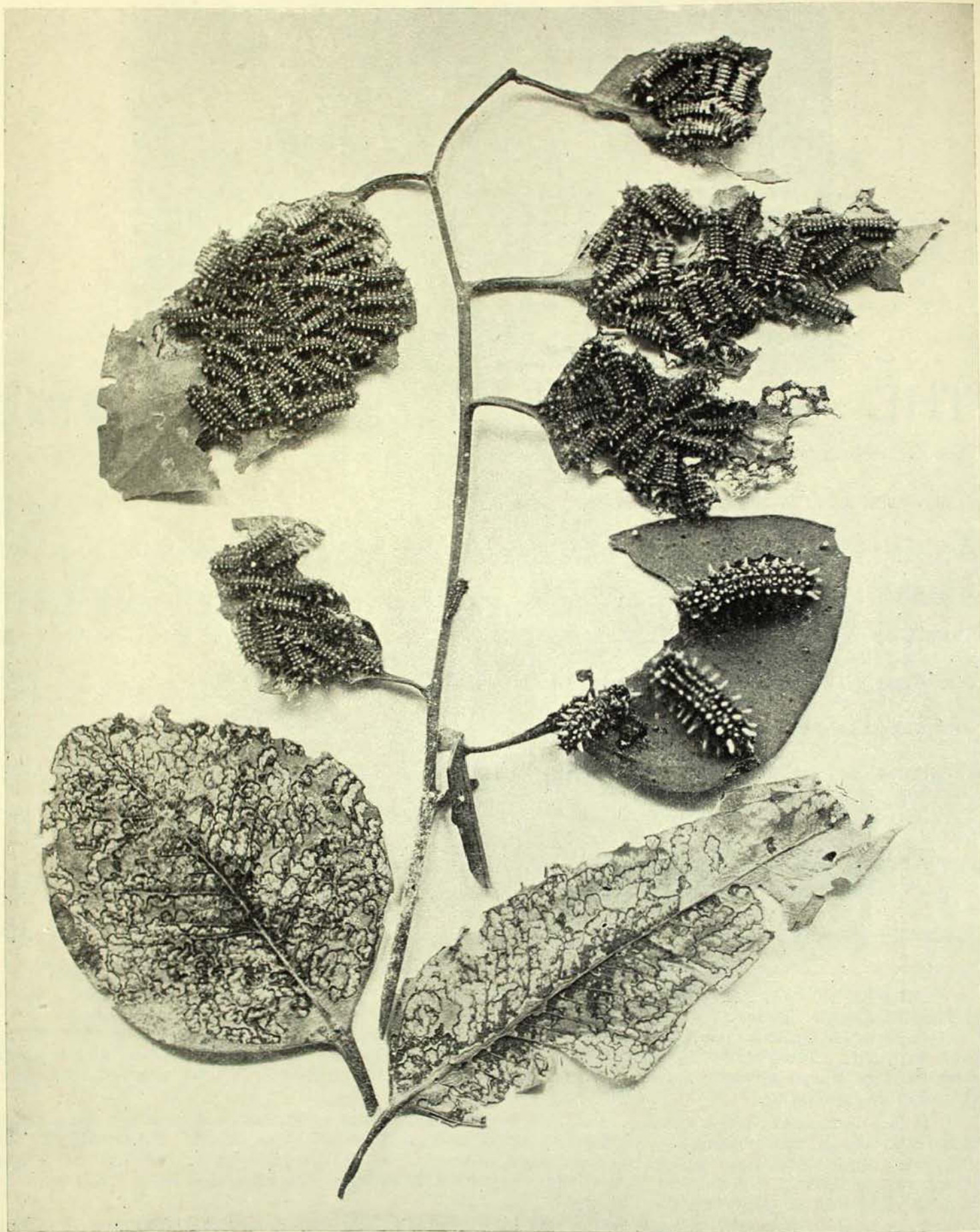
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● OUR FRONT COVER. The Elfin Wren or Redbacked Wren (*Ryania melanocephala*), is by Lilian Medland. It is one of the series of postcards issued by the Australian Museum.

This wren differs from the Blue Wren in its coloration, and in possessing shorter wings and tail, and non-erectile ear coverts. It ranges from north-eastern New South Wales north and west to north-western Australia, and is divisible into a number of races, the red coloration varying in intensity.

It is a somewhat local species, confined to heathlands and areas covered with low vegetation, and it is much more secretive in its habits than the common Blue Wren. Nevertheless, the beautiful male bird may often be seen as it perches for a moment upon the top of a low bush before diving down once more into the grass or scrub. The song is a little sibilant gush, not so loud nor so clear as that of the Blue Wren.

This bird is entirely insectivorous. It breeds during the spring and early summer, building a dome-shaped nest of grass lined with vegetable down. Three or four tiny eggs are laid, white spotted with pinkish brown or red.



Larvæ of a Cup Moth (*Doratifera casta*). The illustration shows the characteristic habit of feeding on the leaves in massed formation.
Photo.—H. Barnes.



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VOL. VI, No. 5.

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Art Galleries and Museums Association of Australia and New Zealand

FOUR years ago the Carnegie Corporation of New York made a survey of the art galleries and museums of Australia and New Zealand as part of an Empire survey of these institutions. Following on this, the Corporation made a grant of \$50,000 each to Australia and New Zealand for the purpose of improving art galleries and museums in Australia and New Zealand and extending their educational work.

Last year a conference of the Directors of Art Galleries and Museums was held in Melbourne to discuss various questions of common interest. This conference, which was financed by the Carnegie Corporation, was presided over by Professor H. C. Richards, who, with Mr. S. F. Markham, had prepared a report on Australian and New Zealand art galleries and museums, which was published by the Corporation. At the Melbourne conference a resolution was passed providing for the inauguration of an Art Galleries and Museums Associa-

tion of Australia and New Zealand, and a draft constitution was drawn up for consideration at the Auckland meeting of the Australian and New Zealand Association for the Advancement of Science held in January of this year. The Carnegie Corporation very generously provided financial aid to enable a meeting to be held in Auckland, where a constitution was adopted and office-bearers were elected.

According to the Constitution "The object of the Association shall be to promote within the Commonwealth and Dominion the educational value of art galleries and museums, to increase and diffuse knowledge of all matters relating to them, to encourage helpful relations among art galleries and museums, their governing bodies and staffs and all others interested therein."

The membership of the Association will consist of the members of the professional and administrative staff of art galleries and museums not conducted for private profit, the members and boards or com-

mittees of such institutions, and other persons interested in their development. In addition to ordinary members, others who are interested in furthering the objects of the Association may be elected as associate members, with the same privileges as ordinary members, except that they will not be entitled to vote or to hold office.

The annual subscriptions are: for ordinary members one pound, for institutional members (art galleries and museums) two pounds, for associate members ten shillings.

The headquarters of the Association will be in Sydney.

The office-bearers elected at the inaugural meeting are:

President: Professor H. C. Richards (Brisbane).

Vice-Presidents: Mr. J. S. Macdonald (National Gallery, Melbourne), Dr. C. Anderson (Australian Museum, Sydney).

Council: Mr. J. Barr, M.A. (Art Gallery, Auckland), Mr. L. Glauert, B.A. (Western Australian

Museum, Perth), Mr. L. McCubbin (Art Gallery, Adelaide), Mr. D. J. Mahony, M.Sc. (National Museum, Melbourne), Dr. J. Pearson (Museum and Art Gallery, Hobart).

Honorary Secretary-Treasurer: Mr. A. R. Penfold, F.A.C.I., F.C.S. (Technological Museum, Harris Street, Sydney).

The inauguration of this Association is an important event in the history of the art galleries and museums of Australia and New Zealand; for the first time a body is in existence which can speak for all such institutions in the Commonwealth and Dominion, take action or make recommendations in matters affecting their interests and objects, and, most important of all, arrange for periodical meetings, at which matters of common interest may be discussed. The Constitution provides a wide field for membership, and it is hoped that all Australians and New Zealanders who are interested in the objects and work of art galleries and museums will join the new Association.

FORTY FATHOMS DEEP. By ION L. IDRIESS. (Angus & Robertson Ltd., Sydney, 1937.) Crown 8vo, pp. 343, 28 photographs. Price: 6s.

Mr. Idriess has established himself as a graphic writer of books on the more primitive and adventurous aspects of Australian life, and in this work he takes up the story of the pearling industry. The dangers and hardships of the pearler's life, the romance of the quest for shell and the occasional pearl of price, the loves and the hates of the Koepangers, Japanese, Malays, and others who make up the very mixed population of Broome and other pearling towns, offer full scope for the picturesque descriptive

writing of which Idriess is a master. The book is informative, too, for the author knows the technique of pearling and something of the queer creatures which live in the depths where the diver pursues his dangerous calling. Many dramatic happenings are chronicled in this fascinating work, and the author's terse style enhances the drama. Witness the rough and ready surgery (with a pocket knife) which saved the life of Willie McBryde: "Waiting his chance, Goldie knocked his patient unconscious by a blow on the jaw; quickly inserted a cleat to keep his mouth open; put the sail needle through the tongue to keep it out of the way, and lanced the quinsy."

C.A.

The Cup Moths

By KEITH C. McKEOWN

FEW groups of moths possess such curious habits as those of the genus *Doratifera* (family Limacodidæ) and their allies, which are popularly known as Cup Moths. Thirty-five species of the family have been described from Australia, but their range does not extend to New Zealand, although they are known from other lands. Most of the species force themselves upon one's attention by reason of their stinging caterpillars.

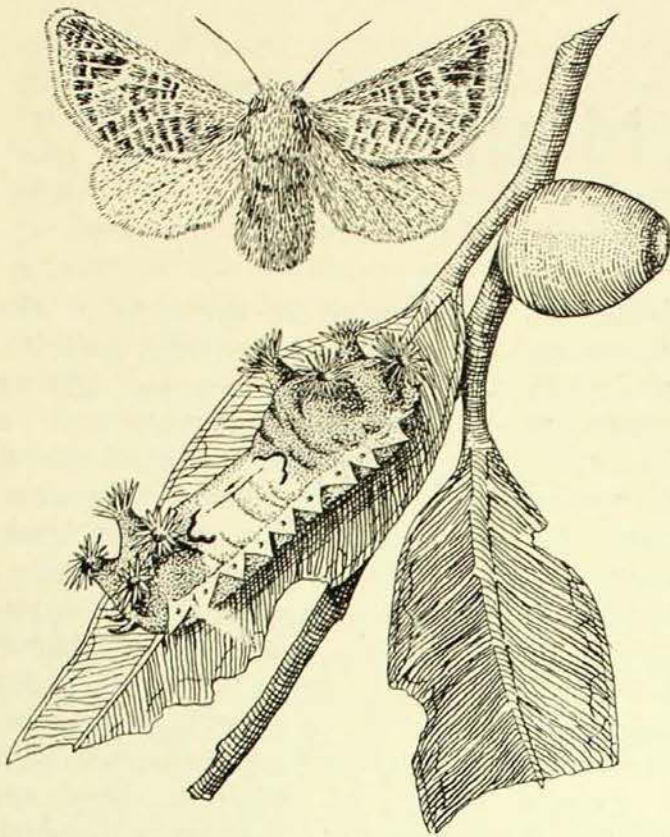
The eggs are somewhat flattened, round, yellowish objects, and are laid in rows upon the surface of a leaf, and in the case of Oxley's Cup Moth (*Doratifera oxleyi*) they are frequently deposited in from four to five slightly diverging rows, somewhat suggestive of the fingers of the human hand. Perhaps some sixty or seventy eggs may be laid in one batch.

The tiny caterpillars, when first hatched, feed upon the surface of the leaf, covering it with irregular brown blotches, but as they grow they work from the edge, biting away the entire tissue of the leaf with great sweeping strokes of their mandibles, until nothing but the tough midrib is left. This is especially the case where the infestation is heavy. The fully grown caterpillar is a curious saddle-backed creature. It varies somewhat in colour with the different species, but all are of a delicate green colour ornamented with brown blotches. A festoon of triangular flaps decorates the lateral margins of the creature, giving it quite a bizarre appearance. Both extremities of the caterpillar are raised into rounded humps, and each of these elevated areas is armed with four clusters of bright yellow spines—prickles sharper than the keenest needles—set upon the summit of tubercles. When the insect is at rest, or feeding undisturbed, these spines are folded downwards, where they

lie flat in depressions in the tops of the tubercles. Disturb the creature, and immediately the spines are erected, giving each tubercle the appearance of a miniature sea anemone. Should these spines come into contact with the skin, when one is passing through the bush, they pierce the flesh and set up an intense nettle-like irritation, and, in some cases, large white lumps may be produced, although no really serious results have been reported. It is uncertain whether the spines are hollow and connected with a poison gland, or whether they are coated with some irritating substance, but a poison of some sort certainly seems to be present, for the inflammation is not caused by the slender hairs breaking off and remaining in the flesh, as is the case with the irritating hairs of the Processionary Caterpillars and others. Ammonia or wet soap applied to the stings will usually suffice to relieve the pain.

When mature the caterpillars seek out a suitable twig, on the side of which they spin rounded cocoons. At first the structure is of silken texture, frail and transparent, so that the larva may be seen within, its head moving steadily backwards and forwards as the fine thread is spun and applied to the walls, thickening them until they are no longer transparent. The cocoon is as yet soft and yielding to the touch, but as a final act in the construction the caterpillar produces a brown varnish which permeates the structure, changing its texture to that of a hard, smooth *papier mâché*.

The completed cocoon is rounded, and so carefully attached to the bark of the tree that it appears to be part of it—an illusion that is intensified by its colour closely matching that of its foundation. The object looks, for all the world, like one of the rounded, woody, coccid galls



The moth, larva, and cocoon of the Painted Cup Moth (*Doratifera vulnerans*).

N. B. Adams, del.

that distort the branches and twigs of the eucalypts. In *Doratifera oxleyi* the cocoons are oval, but in the Painted Cup Moth (*D. vulnerans*) they are pear-shaped, and attached to the twig by the broader end.

Within the cell, changes are still proceeding. The caterpillar becomes soft and flabby as its tissues are broken down and transmuted into the form of the future insect. The larval skin is shed, revealing the pupa or chrysalis, and this cast skin is packed into an exceedingly small bundle and stowed away at the bottom of the cocoon, where it will in no way interfere with the occupant. The pupa is at first whitish and semi-transparent, with two slender black jaws showing clearly against the general pale colour; these are the cocoon-breakers which aid the insect in escaping from its prison, but, their purpose fulfilled, they are shed, and there is no trace of them in the perfect moth. Prior to emergence, the pupa darkens in colour, becoming a dull brown. The limbs and wings are folded

Larvæ of Oxley's Cup Moth (*Doratifera oxleyi*) feeding upon the foliage of the Red Gum.

Photo.—K. C. McKeown.



close down against the sides of the body, giving the creature something of the appearance of an Egyptian mummy.

The following spring the pupa stirs into activity, and, with the aid of the cocoon-breakers, cuts a smooth-edged lid from the apex of the cocoon, much like the top of a breakfast egg, as it is removed to expose the contents.

The moth on emergence is wet and bedraggled, its wings lying close against the body, limp and crumpled like wet cloth. The insect clings to the twig, and slowly the wings expand, take shape and harden, and in a few hours the moth is capable of flight, and at dusk joins its fellows, seeks a mate, and, within a day or two, deposits its eggs, ensuring the perpetuation of the species, and dies.

The perfect insects vary somewhat in colour according to the species concerned, but they are all stoutly built moths, with heavy bodies thickly covered with soft down; they are a general brown colour, with the forewings marbled with greyish tints.

The commonest species found on the coast is the Painted Cup Moth (*Doratifera vulnerans*), but in the interior of the State it is almost entirely replaced by Oxley's Cup Moth (*D. oxleyi*). A second coastal species (*D. casta*) has a larva which differs strongly from the others, and is jet black in colour, armed with four longitudinal rows of short, thick, yellowish, spine-like protuberances, and, between them, small spots and streaks of the same colour.

In the red gum forests along the rivers in south-western New South Wales, Oxley's Cup Moth occurs in such immense numbers as to constitute a formidable forest pest. I have seen many miles of country in which almost every gum seedling was denuded of its foliage, and the masses of caterpillars clinging to the leafless branches presented a remarkable appearance. In the stillness that falls upon the bush in the heat of mid-day, no

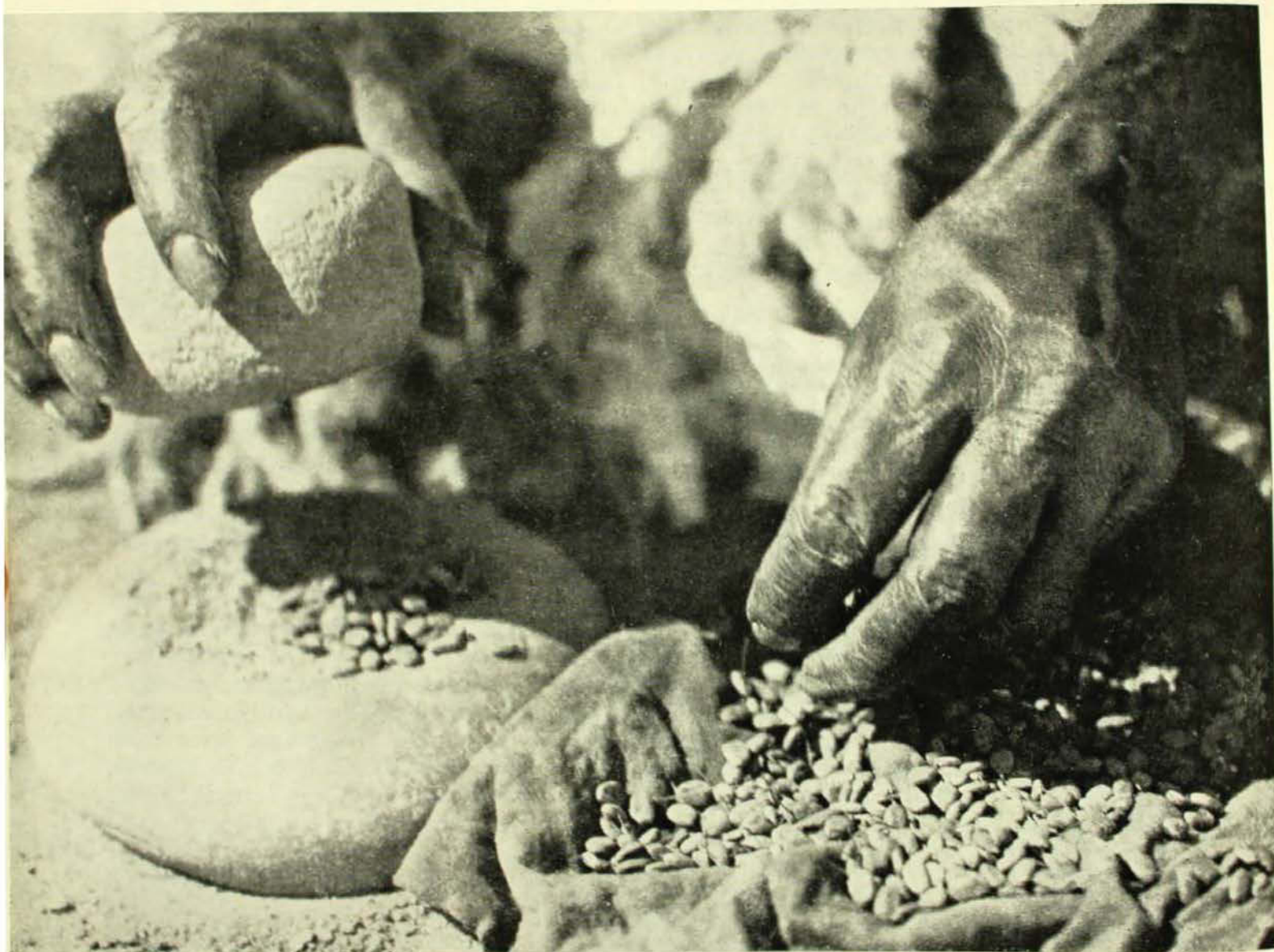
sound could be heard but the constant pattering as of a heavy fall of rain—the dropping of excreta from countless millions of caterpillars onto the dead leaves covering the ground beneath the trees. When the caterpillars matured, so great was the competition for suitable places in which to spin their cocoons and pupate, that the trunks of the trees were covered thickly with the cocoons, often so closely packed together that they were squeezed and distorted from their rounded form, and only those upon the edges of such masses had opportunity to display their normal rotundity. Fortunately, in spite of the hardness of their cocoons, the Cup Moths in their immature state are heavily preyed upon by other insects—mainly small parasitic wasps—which keep their number more or less within reasonable bounds.

An allied species, *Susica semicana* (the *Apoda xylomeli* of Scott) is of interest, and deserves mention here as its caterpillars are among the few insects that feed upon the foliage of the waratah and the Banksia. This larva, unlike many of its relatives, does not bear stinging spines: its surface is shagreened and slightly sticky to the touch. In colour it is a clear, bright green, becoming paler towards the centre of the back, along which runs a straw-coloured stripe edged with pale bluish-green, while two small pointed, yellowish projections arise from the second segment. This colour scheme, striking as it may sound, is actually a fine example of camouflage, and, when the caterpillar is resting upon the leaf of a waratah, its detection is extremely difficult.

The cocoon is composed of silk lightly covered with sand-grains, and is buried at the base of the plant which formed the food of the caterpillar. The forewings of the adult moth are blackish, and blotched with irregular patches of light chestnut-brown; the hind wings are of a uniform yellowish-brown.

Amongst the Aborigines

PHOTOGRAPHIC STUDIES BY FRANCIS BIRTLES



Preparing Nardoo Seeds.

Although the Australian aborigines do not cultivate the soil they make full use of Nature's supply of vegetable foods. Above is shown the pounding of nardoo, a water plant, by means of a stone pestle and mortar. The crushed mass is ground into flour, water is poured into it so as to form a paste, it is then beaten into a flat cake, and cooked in ashes to form a damper. Nardoo seed is not very nutritious, but in drought conditions, when other seed foods are scarce, it is eaten by the natives. Glengyle, Georgina River, south-west Queensland.



The Didgeridu.

In northern Australia a musical instrument known as the Didgeridu is used; it consists of a section of a hollow branch of varying length and diameter. During ceremonies songs are chanted through it and the hunter employs it to amplify his imitation of the call of the emu so as to attract the birds within striking distance. It is often decorated with painted designs and a band of gum is set on one end as a mouth-piece.

The body is wrapped in marsupial skins and buried in a grave which is lined with bark and grass; over this a mound is built which is composed of earth, grass, bark, branches and logs. The space around the tomb is swept clean for some time after the burial ceremony. Mulligan Sandhills, south-west Queensland.



An Aboriginal Tomb.

Double-Headed Fishes in Australia and New Zealand

By GILBERT P. WHITLEY

IT has been thought worth while to place on record some of the curious cases of two-headed sharks and fishes which have come to light in recent years, more especially those from Australia and New Zealand. In other parts of the world these bicephalous freaks have been known for a long time, inasmuch as Ulysses Aldrovandi published a picture of a two-headed shark in his *Monstrorum Historia* in the seventeenth century, the earliest published illustration of its kind. Since that period numerous references to similarly bisected fishes are to be found scattered in anatomical and ichthyological literature.

Double-headed fish embryos are not uncommon. Every fish-hatchery handling large numbers of eggs has a few every hatching season. In the wild state such fish, even if they survive hatching, soon fall prey to their enemies, because of their inability to move rapidly through the water. From a paper by Dr. Gudger* it appears that there are probably nearly fifty different cases of two-headed fishes on record, one-half of which refer to members of the Salmon or Trout family (Salmonidæ), doubtless because of their extensive propagation by artificial means in hatcheries. The largest bicephalous fish was a trout, 5½ inches long, which was carefully reared in New York State. Other fishes which have given rise to double-headed monsters are the fresh-water Perch (*Perca fluviatilis*), the Pike (*Esox lucius*), Tooth Carp (*Girardinus*), Killifish (*Fundulus*), even embryo lampreys (*Petromyzon*), and, very rarely, marine Catfish (*Felichthys felis*). To these cases I would add that there are some dubious records of double marine

fishes (wolf fish and mackerel) and several authentic ones of baby sharks with two heads. Nowadays aquarists are even obtaining occasional Siamese twin examples of their pet Guppies and Sword-tails.*



A double-headed shark, about three feet long, depicted in red amongst prehistoric rock-paintings near Waikari, New Zealand.
After J. von Haast.

AUSTRALASIAN RECORDS.

Coming now to the Australasian cases, the earliest record I have been able to trace is apparently a relic of the autochthonous inhabitants of New Zealand, for Professor Haast has reproduced† some ancient rock paintings found in the Weka Pass ranges in New Zealand, amongst which is depicted a double-headed marine monster, possibly a shark.

Then there was the exhibition by Dr. J. C. Cox of photographs of a Siamese twin Gummy Shark (*Mustelus antarcticus*) from New Zealand before the Linnean Society, Sydney, in February, 1892. Also there is an anonymous note in *The Australian Magazine*, October 1, 1909, p. 895, as follows: "The most remarkable shark ever caught was secured by Fred Miller of Tacoma, in 1901. It was eight feet long, and had two heads and two tails on the one body."

This, however, does not refer to an Australian specimen, and may be inaccurate, particularly as regards size.

* *The Aquarium* (Ed. W. Innes), i, 1933, p. 310, iii, 1934, p. 175, and v, 1936, p. 156.

† *Trans. N.Z. Instit.*, x, 1878, p. 48, pl. i, fig. 3.

* Gudger: *American Museum Novitates*, 369, 1929.

A third reference completes all the Australian writings on this subject known to me. This is a note and a photograph of an apparently double-headed Snapper (*Chrysophrys auratus*) from New Zealand, in a pamphlet by J. G. Hay entitled "Something About Fishes", published in Western Australia about 1909. This Snapper, caught off Rakino Island, outside Auckland, New Zealand, was shown as having two heads and two shoulders, but only one body and tail. Its weight was given as 28 lb., which, if authentic, is a record for a double-headed fish. The specimen was said to be in the Auckland Museum, but Mr. Powell of that institution informs me that he can find no record of it now. Perhaps it was a fake.

I may mention here that there is a normal species of fish (*Coris aygula*), called the Doublehead because of the protruding bony forehead, which is even more prominent than that of the snapper. This is a kind of parrot fish, and was illustrated in a recent number of this MAGAZINE.

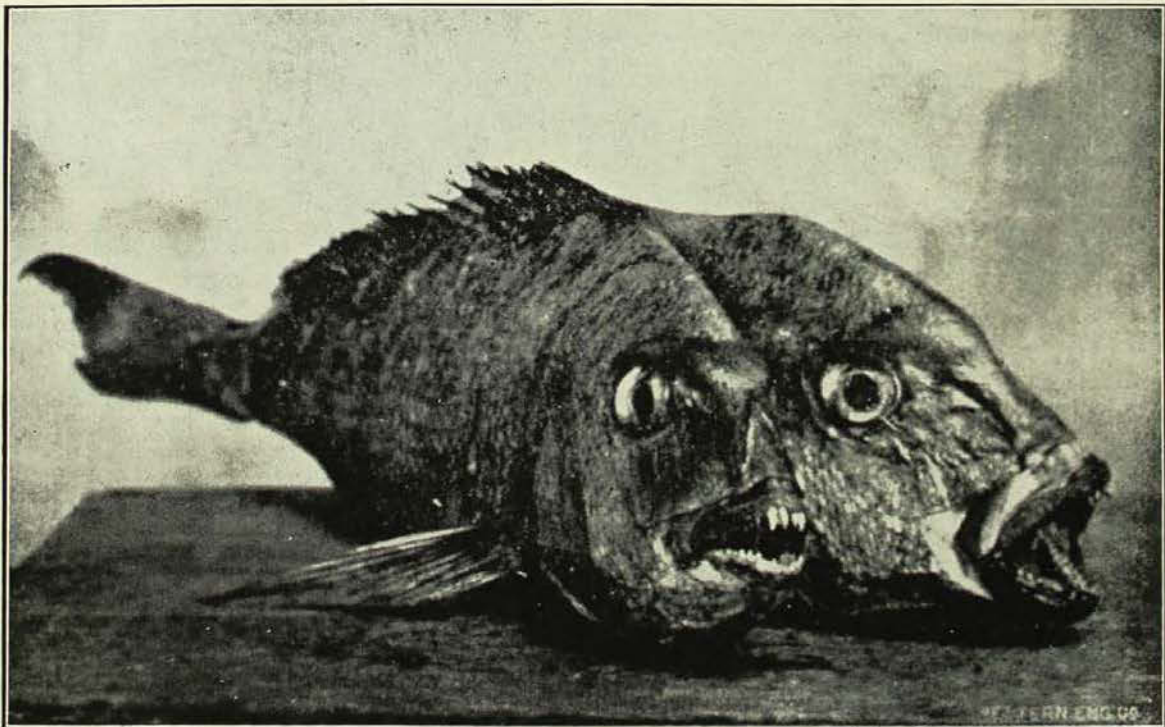
Some years ago Mr. D. G. Stead, when General Manager of the N.S.W. State Trawling Industry, presented a large and valuable collection of fishes to the

Museum. Amongst them were several freaks, including some Siamese twin Trout (an introduced fish) and a double-headed Salmon Catfish (*Neoarius australis*) from the Richmond River, New South Wales.

During the breeding season, the large eggs of the Salmon Catfish are carried around in the mouth of the male fish up to the time when the young are developed sufficiently to escape, and until then the father fish does not feed; hence many fishermen wrongly believe that the catfish eats its own eggs and young. Amongst a series of such young catfish in various stages of development, presented by Mr. Stead, was one two-headed specimen. It is about $1\frac{1}{2}$ inches long, and the "cat's whiskers" on each head can be seen in the accompanying illustrations. The original specimen is on view in the Museum gallery in a case next to some specimens of double Rainbow Trout (*Salmo irideus*) from Prospect, New South Wales. I have also seen Siamese twin Trout at Rotorua, New Zealand.

DOUBLE-HEADED SHARKS.

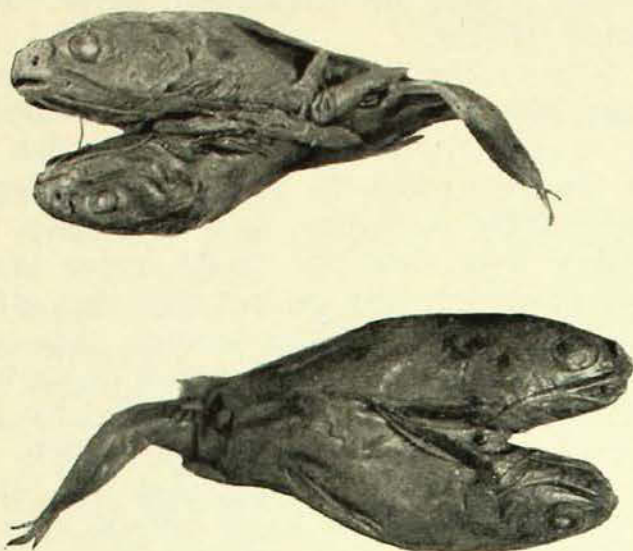
Dichotomic sharks have been written about from the English Channel, South



A double-headed Snapper, weight twenty-eight pounds, caught off Rakino Island, outside Auckland, New Zealand. The fish was said to be perfect up to the dorsal fin, but possessed two shoulders and heads.

After J. G. Hay.

Africa, South America, and elsewhere, and they also occur in Australia and New Zealand. I am informed that there is a two-headed Gummy Shark in the Museum



Two views of a specimen of double-headed Salmon Catfish from the Richmond River, New South Wales. Length about one and a half inches.

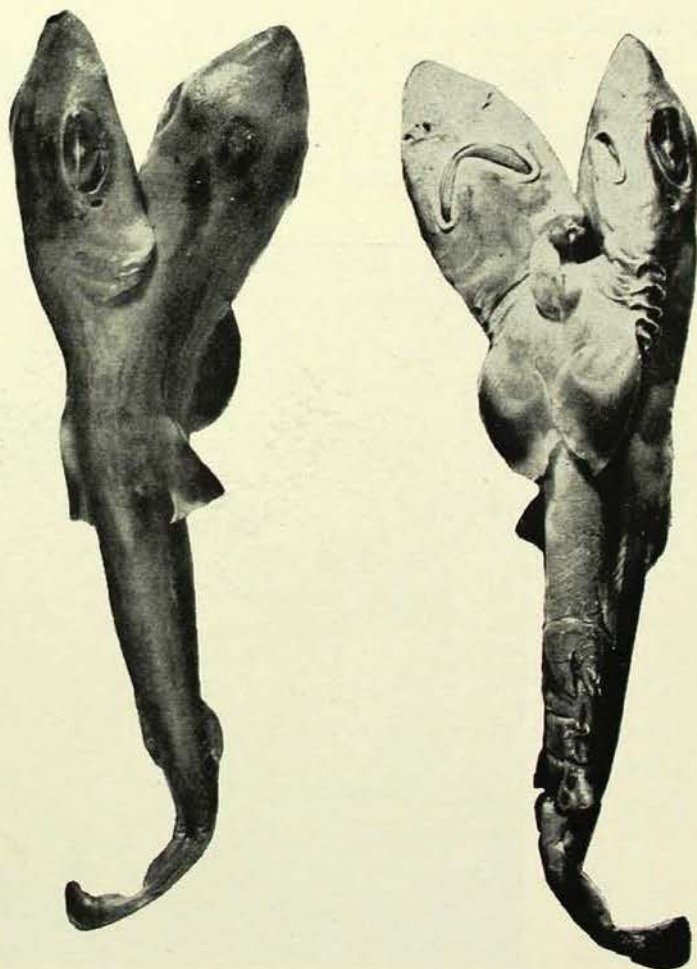
at Hobart, Tasmania, whilst Mr. A. W. B. Powell informs me that the Auckland Museum has a double-headed juvenile School Shark (*Notogaleus australis*) from Opotiki, Bay of Plenty, New Zealand. This specimen is about $5\frac{1}{2}$ inches long, and, he says, has the two heads complete, each with paired gills, but only two pectorals. These pectoral fins are not quite opposite, and the heads are not symmetrically divergent, the right hand one swinging off at a tangent from the other, which is not far out of alignment.

In the Dominion Museum, Wellington, is a painting of a young white-spotted Dogfish (*Squalus kirki*) with two heads and two tails. It was obtained at Hokitika, New Zealand, by F. E. Clarke on September 20, 1875.

I now have another unusual specimen of a shark to record. About seven years ago a double-headed male embryo Gummy Shark (*Mustelus antarcticus*) was obtained in Botany Bay, and has since been exhibited at various shows by its owner, who proposes to deposit it in the Australian Museum at some future date. A picture of it is given here. It has two heads (and therefore four eyes

and nostrils instead of two, twenty gill slits instead of ten, and two mouths instead of one) and is nearly five inches long. The upper parts of the back are also duplicated, so that there are four dorsal fins instead of two, but the fins on the lower surface of the body are normal. It is too young to have teeth. The colour is brownish grey above, darkest on the fins, with a yellowish tinge on the belly, and the eyes are blue. One head is twisted to one side in relation to the other, apparently a hitherto undescribed feature even in these rarities. Generally the heads of bicephalous sharks are side by side (lateral schizocephaly), whilst in our Siamese twin Catfish the heads are chin to chin and the bodies are united ventrally, a condition known to the pedantic as anakatadidymus.

We are generally informed that two heads are better than one, but I think that these short-lived little finny freaks effectively contradict that age-old maxim.



Upper and lower aspects of a two-headed Gummy Shark, length about five inches, from Botany Bay, New South Wales.

Collecting in Central and Northern Australia*

By HAROLD O. FLETCHER

THE vast inland areas of Australia have been referred to by many authors in unflattering terms, leaving the reader with an impression that Central Australia is a land of sandy wastes, "gibber" plains, and with little or no animal life. This is not the case by any means. Many parts of the "Centre" are most attractive and picturesque, while the brightly coloured birds, with their enchanting songs, are only a small part of one of the most remarkable faunas in the world.

It is difficult to appreciate the extent of our continent. One could say that the useless country of Central Australia, the wastelands referred to by J. W. Gregory as "The Dead Heart of Australia", is equal in size to the area of England and Wales. This country, which includes the Lake Eyre Basin, extends approximately from Marree in the south to Charlotte Waters in the north and east to the Queensland and New South Wales borders. Here we find an unbroken monotony of arid conditions with little or no vegetation.

In July, 1936, the author, accompanied by Mr. W. Barnes, also of the Museum staff, left Sydney in a utility truck to make a hurried collecting trip through Central Australia. The object of the expedition was to collect rare birds and animals, but primarily to investigate and collect fossils from the Ordovician beds of the MacDonnell Ranges, and Cambrian trilobites and brachiopods from beds in the Northern Territory and North Queensland.

The trip from Sydney to Melbourne was uneventful, and we continued on to Adelaide via the south-east coast. From

Kingston an excellent road across the Coorong led us to Meningee, and from there we passed through Murray Bridge to Adelaide.

To reach Alice Springs there is the choice of two tracks. The eastern track follows the north-south railway line and passes through Quorn, Marree and Oodnadatta. After negotiating the Depot sand hills and leaving Charlotte Waters behind, Alice Springs is reached after covering a distance of about one thousand miles from Adelaide. The western track, which passes through Coober Pedy and Henbury, is fifty miles longer than the eastern route, but, as it goes through a much better type of country, with less sand, it was decided to follow this course.

From Adelaide an excellent road leads to Port Augusta. The Flinders Range is crossed through Horrock's Pass, a magnificent piece of road-building. After the range is crossed one immediately sees a change in the country from well-grassed fields carrying plenty of stock to what is practically desert country, sandy wastes with stunted trees and salt-bush.

INTO THE CENTRE.

Before we left Port Augusta final details of the trip were attended to and additional springs fitted to the car to assist in combating the rough country to be traversed. Alice Springs was the next benzine depôt, so that supplies had to be carried to take us at least one thousand miles. Crossing the narrow bridge near the wharves, we found ourselves immediately negotiating sandy desert country, over which the car speeded with no trouble towards our first stop, East Well Station, about 180

* Photographs by the author.



*Coober Pedy opal fields.
In this desolate area the
dwellings are all
excavated underground.*

miles distant. The track frequently crossed the transcontinental line, until finally, turning north, our course lay across undulating country with low-lying, flat-topped hills. We were now on the "gibber" plains, the country being covered with small purple-brown stones varying in size up to two and three feet in diameter. Progress was slow, and, although a good look-out was kept, there were no signs of any kind of life. It would be difficult to imagine anything more desolate than "gibber" country, and yet it has a grandeur which, subtle as it is, makes one appreciate even the barrenness of the scene through which we motored. The flat-topped hills we found were composed of hard sandstone. These indicated the original level of the land, while the "gibber" plains represent the residue of the mass broken up by weathering into the small stones.

Central Australia is a land of almost perpetual sunshine. Month after month the sun shines brightly and fiercely in a sky free from clouds, but the nights are cold and invigorating.

Nearing East Well Station the appearance of the landscape changed considerably and scrub country was entered, with some little grass-lands and salt-bush. Splashes of vivid colour throughout the vegetation reminded us that even in Central Australia wild flowers exist. Many of them were everlasting flowers, but a large number were delicately perfumed and very beautiful. East Well is a sheep station of about 6,000 square miles, and some of the best merino wool in Australia is grown there.

OPAL FIELDS.

Our next call was Coober Pedy, about 190 miles to the north, and after traversing good country we again met with desolate plains, in the midst of which we sighted the wireless masts of the opal fields. It was midday as we stepped from the car, and the heat and glare were almost overpowering. The single building above ground is the store, built in a depression which catches all the intensity of the sun. After we had purchased some food and fresh eggs we looked around in the hope of securing specimens. The entire community in Coober Pedy lives underground in homes cut out of the soft matrix in which the opal occurs. Several homes I visited had two and three rooms, spotlessly clean, and, what is more important in that climate, gloriously cool. The marvels of the modern age and their benefit to mankind were forcibly brought home to us when our host switched on his short-wave radio set and we listened to a perfect reception of news being broadcast from London. Very little opal is being won from the field, and it is at least six months since any valuable opal was unearthed.

We were not sorry to leave the opal fields, and before long were pleased to notice that the country was again improving. Mabel Creek was passed after about forty miles' travelling, and then sixty miles brought us to Mount Willoughby Station. The country through here was good and the bird life plentiful. Amongst the scrub were a large number of what are popularly called Whitefaces. These

small drab-coloured birds are restricted in their range, and the particular species in this area are not found elsewhere. The Twelve Apostles or "Happy Family", *Pomatostomus rubeculus*, continually attracted attention to themselves by their weird cries and curious antics as they jumped from branch to branch.

From Mt. Willoughby to Welbourne Hill is about 97 miles, and then a comparatively short run brings one to Lambina Station.

Our truck made little of one of the worst sandy river crossings outside Lambina Station, and from here to Kulgera the country changed to sandy conditions with numerous sand hills about twenty-five feet in height. The sand is deep and loose, but by keeping to the tracks and speeding up the sand ridges are easily negotiated. North of Tieyon Station the road passes over very rough hilly country, but improves again as Dr. Stone's station is approached. We were surprised to hear that in December, 1935, the flood waters had risen to such an extent that water was four and five feet deep in the homestead. High water mark was still on the walls, the only evidence of heavy rainfall, as the country looked very dry, the rivers were free of water, and little grass was to be seen.

At Henbury Station, our next call, the Finke River was crossed for the first time. The crossing had been improved and no difficulty was experienced in driving over the wide river bed. To the right of the crossing a large waterhole is visible and one that rarely dries up. Along the banks of most of the rivers in this country are large white gum trees, or "Ghost" trees, as they are called by the residents. These thrive wonderfully well with such a small rainfall, and attain considerable size, many towering to a great height in the air.

After leaving Henbury Station and the Finke River, we still travelled north towards Owen Springs, but before reaching there had to cross the Hugh River about thirteen times. The Hugh River rises in the MacDonnell Ranges and later

joins the Finke slightly north of Horse-Shoe Bend.

Before reaching Owen Springs Station the track passed over the Waterhouse Range, an eroded anticline with north and south sides consisting of Ordovician quartzite rising several hundred feet above the plain. The central mass is composed of pre-Cambrian limestone, some of the most ancient rocks in the world, and contained signs of fossils; a series of specimens was collected. After negotiating the exceedingly rough track through the Waterhouse Range, the Owen Springs homestead was noticed on the western bank of the Hugh River. The river was now crossed for the last time and an easy run was before us of about forty-five miles to the MacDonnell Ranges and Alice Springs. Twenty miles out we passed the turn-off to Hermannsburg Mission Station and Palm Valley. We had hoped to visit the Mission Station and investigate the fossil beds at Ellery's Creek and Boggy Hole Creek, but unfortunately the beds were inaccessible by car, and time did not allow us to arrange transport by camels. The beds at these two localities are Ordovician in age, and specimens of brachiopods and trilobites, with many other species, are plentiful, although not well preserved. The MacDonnell Ranges were now in sight and the country had improved marvellously. Although the rivers were dry, good rains had been experienced six months before, with the result that the country for the most part was covered with a profusion of wild flowers. On the way north we travelled many miles through country completely covered with delicately perfumed flowers. In the cool of the evenings the air was laden with the perfume of a few of the strongly scented species, and frequently we found it almost impossible to reconcile our surroundings with the fact that we were in Central Australia.

Nearing Alice Springs we entered a valley of the MacDonnells, and after passing through the Police Paddock sighted the railway and telegraph line.

The wide sandy crossing of the Todd River had to be negotiated to pass through Heavitree Gap, and the township lay before us.

The MacDonnell Ranges are one of the most outstanding features of Central Australia, a narrow range extending east and west and towering to heights up to 5,000 feet. They are approximately 250 miles long and would be impassable if it were not for the gorges or gaps cut into the range by streams. The gaps owe their origin, in all probability, to the fact that the streams which now flow through them were able to keep pace with the gradual elevation of the mountain ridge, the streams cutting out the gap as the land rose.

ALICE SPRINGS.

Alice Springs is picturesquely situated in the centre of a valley or plain, with Mt. Gillen overshadowing the town to the south-west. During the occasional heavy downpours of rain the Todd River, which runs alongside the town, overflows its banks, but it was quite dry on our arrival, though we were told that only six months before it had overflowed its banks after a heavy downpour of rain and the low country surrounding it was flooded. After rain there is a rapid and luxuriant growth of vegetation, but this does not last for long. The ground being warm gives a decided impetus to the growth, but the change to normal conditions of dryness again is just as marked and the vegetation soon disappears.

Our stay at Alice Springs was longer than originally intended, and this allowed us to collect systematically in the surrounding district. In 1895 members of the Horn Scientific Expedition to Central Australia carried out a great deal of collecting in the Alice Springs area. Many new lizards were collected by them, as well as other forms of animal life.

During our investigations here, excursions were made within a radius of about twenty miles from the township, and the results included collections from the

plains, the foot hills and the summits of many of the MacDonnell peaks. Many beautiful and picturesque gorges are to be found in the ranges. To the east, Emily's Gap intersects a high ridge at right angles, and permanent water there makes an ideal swimming pool. These pools are formed by the torrents surging through the constricted gaps during rain and scouring out large and deep pools.

On the summit of Mt. Gillen two rare grass-birds, *Amytornis purnelli*, were collected, as well as many species of lizards and insects. In the spinifex or porcupine grass, collecting is by no means pleasant, and usually after a day's collecting the night was spent in removing the irritating tips of spinifex spikes from our bodies.

A good method of collecting in spinifex country was discovered. This grass grows in large isolated tufts and, when lighted, burns fiercely. A match thrown into a tuft ignited it and immediately there was a general exodus of the many creatures sheltering in it. Spiders, lizards, and small spinifex-snakes hurried out, and it was then a race to catch them before they reached the shelter of another spinifex tuft. Mr. Barnes acquired a technique of his own in catching these fast-moving species, and few escaped his eager hands. Rocks of all sizes were uprooted and turned in our search for the flat-tailed lizards or geckos which sheltered under them. A large gecko covered with spines and knobs was collected on the summit of Mt. Gillen. This was a most repulsive-looking creature, which later was identified as *Nephurus asper*, a rare species.

When the time came for us to leave Alice Springs we had collected over two hundred lizards, while Mr. Barnes had prepared over fifty bird skins, and with the other material on hand we were pleased with our activities.

THE GRANITES.

It was now decided to visit The Granites goldfield, and after all preparations had been completed we travelled

north through the ranges over a well-made road for about nineteen miles, until the plain country was again reached. We had now left the MacDonnell Ranges behind us and, eighty miles on, a few miles beyond Aeron Hotel, we turned west on the track which leads to the goldfield. The Granites is one of the known habitats of the Golden-Backed Bandicoot, a form rather rare in the museum collections of eastern Australia. The distance from the main north-south track along the telegraph line to The Granites is about 350 miles along a very rough track which traverses every imaginable type of country. As far as Coniston Station the country is well timbered and grassed, in many places having the appearance of park-lands. After leaving Coniston cattle station, however, the aspect of the country changed and the going was very heavy. The track led over rocky ridges, through ant-bed country, changing to black soil, so rough that frequently we had to stop because of the sump resting on irregularities of the road. Before leaving Alice Springs we had been asked to return two blacks to their tribe at The Granites. One had been guide to a party travelling by camels from The Granites to Alice Springs, while the other had been the cause of trouble amongst the tribe and had been taken in for trial. The younger of the two, Roger, was a good hunter, and, after I had made it understood that I wanted several bandicoots, he said: "Yeah! plenty feller alonga there."

We had stopped for lunch along the road when in the distance we could hear the approach of two motor lorries. When they came up, we recognized them as

those of the Adelaide University expedition, which had been carrying out anthropological research amongst the natives at The Granites. Professor Harvey Johnston was a member of the party, and as we shook hands remarked that we had not seen each other since our return from the Mawson Antarctic expeditions of 1929-1931. We had shared a cabin on the *Discovery* on that occasion, and it was strange that our next meeting should be in the centre of Australia, under conditions the direct antithesis of what we had experienced in the Antarctic.

After passing Connor's waterhole, where there is permanent water, we arrived at The Granites late that night. Connor's well is an old aboriginal camping ground, and nearby a large rock showed numerous scars and depressions where the blacks had sharpened their spears. As we travelled at night along the road many small mammals were seen in the glare of the headlights, running across the road, and once a Golden-Backed Bandicoot.

Mr. Chapman, who was in charge of the mines, showed us over the workings and presented us with a nice series of specimens showing the various types of matrix. The Granites was the scene of a short-lived gold rush a few years ago. We met Miss Olive Pink, who had been carrying out anthropological research at The Granites for the last nine months. She was camped several miles from the mines and made contact with Myall blacks, who have not yet had much to do with the whites. Several of her blacks were sent out to hunt for bandicoots, as our time at The Granites was limited. The result was disappointing, no bandi-

At The Granites the aboriginals displayed a keen interest in the expedition. Miss Olive Pink, who is engaged in anthropological research, may be seen above the bonnet of the truck.





On the road to The Granites. This waterhole is a camping place for the aborigines.

coots being found. However, they collected many rare lizards.

TENNANT'S CREEK.

We all sighed with relief when we again met with the main track along the telegraph line and followed a well-beaten road through Barrow Creek to the Tennant's Creek goldfield. About twenty miles south of Tennant's Creek we passed over granite country with a remarkable formation of large rounded granite boulders. These are known as the "Devil's Marbles", and a large number of them cover about a square mile of country.

In the dried-up creek beds were found carapaces of a species of fresh-water crab which had all the appearances of a marine form. These were later identified as *Parathelphusa transversa*, a river crab found only in the arid far northern districts of South Australia. During dry spells they aestivate in burrows dug several feet below the surface of the creek bed or in the banks.

The Devil's Marbles are formed by weathering. The surrounding country presents a surface of fine quartz grit or gravel, which marks the main mass of granite weathered away to the present level. Lying on this surface are the large rounded boulders which have resisted decomposition. This is due to some difference in crystallization rendering the blocks more indestructible than others. Many of the boulders are superimposed with the appearance of having been placed one on top of the other; but this is all due to weathering.

Nearing Tennant's Creek we found a well-graded road being prepared, and

from then on to the township the dust raised by us was worse than a smoke screen during naval manœuvres. This "bull dust", as it is called, is exceedingly fine, and is found in patches all over Central Australia. At Tennant's Creek a visit was made to the Hammer Jack mine, owned by the McCoy brothers. We were presented with an excellent series of specimens showing almost every type of matrix found on the field. A few weeks before our arrival they had come across a narrow seam of matrix which carried 100 ounces of gold to the ton, but unfortunately there was not much of it. The matrix was limonitic and very light in weight. Gold is found in the country rock extending to water level at 321 feet, and occurs over an enormous area of country.

From Tennant's Creek we proceeded north and, joining the main track north to Newcastle Waters, passed Tennant's Creek telegraph station a few miles out of the town. The track follows the telegraph line for mile after mile through well-timbered but sandy country. About twenty miles north of a waterhole and south of Banka Banka Cattle Station the road was blocked by a large mob of cattle. The car was soon surrounded by bullocks that refused to move until the stockman rode up and forced them on their way. They had scented the water in the radiator and our drinking water, and, as they had come 35 miles without water, were very thirsty. It was an exceedingly hot day and we were amused to see, following the cattle, an aboriginal on horseback, wearing three hats and two very bedraggled suits; it was one way of dispensing with suitcases. From Banka

The Devil's Marbles. These large granite boulders occur on the road to Tennant's Creek.



Banka Station we passed on to Helen Springs, and, leaving there at dusk, arrived at Powell's Creek telegraph station late that night. We continued on after midnight and were well on our way to Newcastle Waters before camping for the night.

One of the difficulties of travelling in the centre and in the north is the absence of sign-posts. It is often good fortune that one chooses the right road at a turn-off, and the right road is frequently the one least defined. At Newcastle Waters we had been told to look for the turn-off at the sixth bore, as one road swung back towards Helen's Springs, while the road we were to take proceeded due east. When we arrived at the bore we discovered that cattle had been in drinking and most of the track had been obliterated by their hoof-marks. There appeared to be only one track, but after climbing the bore-mill we saw away to the east the Camooweal track. Without definite instructions one would have taken the defined track and found oneself back at Helen's Springs after a trip of two hundred miles. After leaving Newcastle Waters the road passes through lightly timbered country for about thirty-six miles and from then on open downs are passed over, with occasional belts of timber on ant-bed country, until Camooweal is reached. A good fire-plough road over the hundreds of miles of open downs country allows a good average speed to be maintained. Nearing Anthony's Lagoon, 180 miles from Newcastle Waters, without passing any signs of habitation, we followed a high ten-foot wire fence for about eight miles or more before arriving at the police station. This

fence enclosed a large tract to prevent the depredations of dingoes while experiments were being carried out in the raising of sheep. At Anthony's Lagoon a road turns north to Boroloola.

As we speeded over the downs country birds would fly up from almost under the wheels of the car. These birds were identified as Pratincoles, birds very similar in appearance to swallows, having long pointed wings and a very swift flight. They were apparently resting in the shade of the grass near the track, and took to flight as the car approached. The Pratincole, *Stiltia isabella*, has a wide distribution, as it also occurs as far north as the Celebes and Greater Sunda Island.

CAMBRIAN FOSSILS.

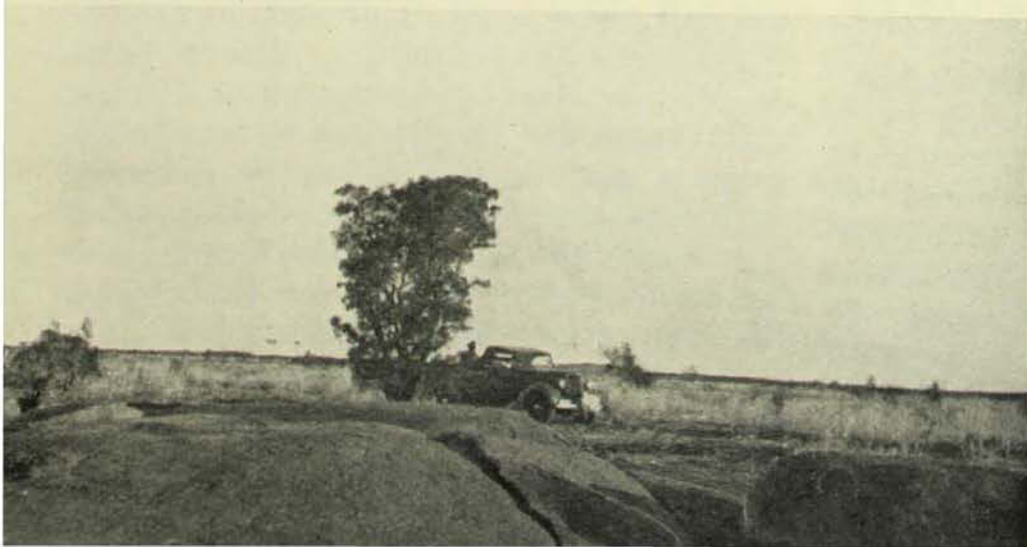
Sixty miles from Anthony's Lagoon Brunette Downs is passed, and a similar distance further on Alexandria Downs is reached. Alexandria Downs was visited by the author in 1934,¹ and some interesting Cambrian fossils were secured in a well, at a depth of 30 feet, five miles north of the homestead. In the hills about twenty-five miles to the north an endeavour was made to secure specimens of a rare wallaroo, but the rough country and tall grass made it almost impossible to sight them. In 1904 a collector from the British Museum secured a skull of a wallaroo at this locality which was taken overseas and described by Dr. Schwarz in 1910 as *Macropus robustus alexandriæ*. It is now thought that this form is the northern race of *Osphranter crubescens*, the Euro or Central Wallaroo.

¹ "Trilobite Hunting in the North", *Australian Museum Magazine*, Vol. v, No. 9.

A further visit was made to the well where the Cambrian fossils were secured. The country rock at Alexandria is limestone, which overlies a westerly extension of the Cambrian beds outcropping so largely at Mt. Isa and other localities in that area. The rocks brought up from the well revealed an interesting fauna very similar to Cambrian fossils found in North American Cambrian beds. After several days' collecting we were forced to leave this interesting locality on account of continual tyre trouble, and reluctantly left the kind hospitality of Mr. and Mrs. K. Johnston. It is about one hundred and fifty miles to Camooweal from Alexandria, and this trip was easily done in one day, passing through Rankine and Avon Downs, where we renewed acquaintance with Mr. J. Spratt, the manager of the station. The track from Newcastle Waters had been splendid, but after leaving Camooweal *en route* to Mt. Isa we entered heavily timbered country through which the poor state of the road taxed the springs of the truck to their utmost. Thirty miles out of Camooweal we came to Split Rock Crossing on Waroona Creek, and found Cambrian beds outcropping on both sides of the creek. The bed of the creek was dry except for several waterholes, more or less permanent and containing numerous small fish known as "Grunters". In the soft yellow siltstones, collecting revealed a fauna of trilobites and brachiopods. The trilobites were fragmentary and con-

sisted of several genera, while the brachiopods were very well preserved and included new forms. Large white gums fringed the banks of Waroona Creek, and in the cool of the evening these became crowded with birds of many species; a number of the rarer species were collected by Mr. Barnes. A series of fresh-water fish from the waterholes were also caught and were later identified as *Terapon unicolor*, the Spangled Grunter. This species has a very wide distribution throughout Australia, and has been recorded as being brought to the surface through a bore at Corella in north-west New South Wales from a depth of 932 feet. From time to time many reports are heard of these fish coming up through bores from great depths and with eyes bulging, but there must be some other explanation to account for their appearance, as it seems impossible to believe that they could exist at great depths underground.

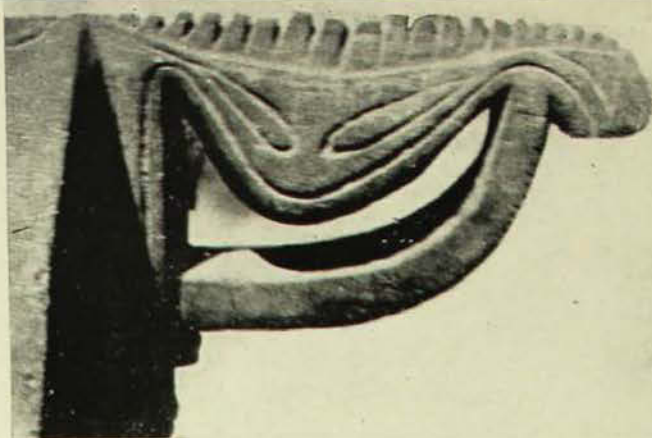
From Waroona Creek the track leads east past Yelvertoft Station, and after crossing through the Cambrian hills near Mt. Isa we arrived at the mining town, which is steadily improving as time goes on. At Mt. Isa a hurried return to Sydney was proposed, and our return was made through Cloncurry, Winton, Blackall, Miles, Brisbane, arriving in Sydney after an absence of about eight weeks, and covering in all over eight thousand miles.



Cambrian Fossil Beds at Split Rock, Waroona Creek, North Queensland.

The Gong Signals of the Tanga

By F. L. S. BELL, M.A., F.R.A.I.



Enlargement of handle (ang kitkita) of gong shewn below.

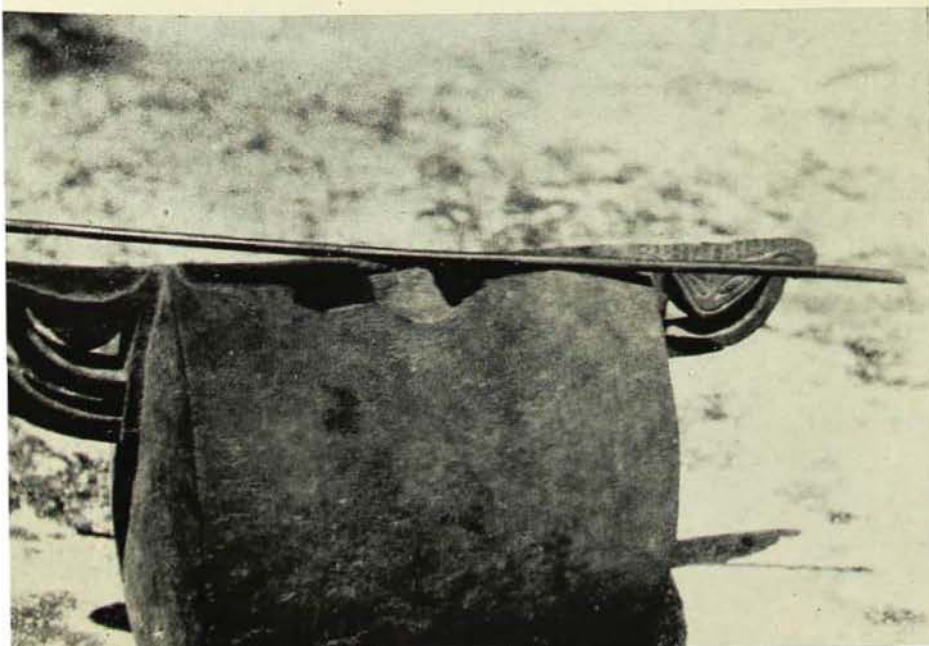
THE throbbing of the signal gongs on the island of Boieng¹ still remains with me as my first audible impression of these primitive folk. The morning was calm, and the schooner in which I approached the island drifted along silently under a light breeze, so that the urgent tapping of the gongs along the sea-shore came undisturbed to my ears. On inquiring from one of the crew, who was a native of Tanga, the meaning of the signal, he told me that it was the *tu-tau-tau* signal or alternatively *tut-tim*, used to announce the arrival of an important visitor.

The sound is produced by tapping on the percussion tongue (*ang kara*) of the gong (*ga:mti*) with a short piece of cane (*am bis*). The signaller uses his partly clenched left hand as a guide for the beater and his right hand as the chief propelling agent. I shall represent the sound made by hitting the gong smartly and decisively with the symbol O, whilst the symbols ----- shall represent a

rattling of the beater upon the percussion tongue. The *tu-tau-tau* signal may thus be represented: -----
- O - O - O - O. This is repeated five times and is concluded by a long roll and a final beat.

Closely allied to the *tu-tau-tau* signal is one which is used as a general assembly signal. This is known as the *fa:tui* or *fina:til* (*fin* = hurry) signal, and is a mere succession of beats and rolls: O --- O --- O ---. Some idea of the native concept of the signals may be obtained from the fact that my informant told me that the sound made on the gong represented the two syllables of the Tanga word *laugi*, meaning: Come! I have heard it used by a house-builder who is impatient at the delay of workmen sent into the bush for timber. I have also heard it used early in the morning to remind neighbours of their obligations with regard to the provision of food for a coming feast. The natives call it the *on mus* or "hurry up" signal, and if it does not produce its intended effect, a chieftain

¹ During 1933 I lived on the island of Boieng, Tanga Group, Bismarck Archipelago, whilst carrying out ethnographic work for the Australian National Research Council.



Log gong (ga:mti) with beater (am bis).



*Sounding the signal pokos
on the log gong.*

will angrily grasp hold of the beater and roll out the *bal-i-suk* (anger) signal. This is regarded as a serious reprimand by those persons to whom it is sent.

At the conclusion of a feast of welcome to kinsmen who have come from distant parts, a signal called *pokos* is sounded. This is really a cycle of signals, since, by means of it, a listener in a distant village can tell how many pigs, how many baskets of yams, how many slabs of nut pudding and how many coconuts were consumed at the feast. It is a most involved signal, and only a few men know it properly. As regards gong signals in general, it may be stated that they are not general knowledge.

Undoubtedly every native understands the meaning of the signals, but only a few have the ability to reproduce them on the gongs. The natives are very critical of a performer on the gong, and the slightest error is greeted with ridicule; consequently the standard of performance is high. Signalling ability is generally passed on from father to son.

A simple variant of *pokos* is a signal called *sif kalene* (*sif* = signal; *en* = feast), which is generally tapped out by the chief holding the feast as an indication that his guests are now free to leave. Another signal commonly used at a feast is the *sif ka:li fil* or signal of impatience. It does not express such deep anger as the *bal-i-suk* signal, but is rather an announcement to parties of invited guests who may be in the neighbourhood that it

is time to bring forward their offerings.

We often read of how fond natives are of displaying huge quantities of food at feasts and distributions of food. Of course, the prestige of the man or group giving the feast is in direct proportion to the amount of food he can display. Similarly, the social position of the feast-maker in Tanga is enhanced by the number of gong signals which he can give during his feast. For example, as soon as he has finished decorating the feasting ground and erecting the food benches, he orders the signal *me-me* to be given on the gong, and if he is certain of the date of the forthcoming feast, he also announces this fact on the gong. This signal of announcement is called *tut-benge* (tapping out/the days), and consists of a number of simple beats, tapped out every hour, from the village of the chieftain giving the feast.

Allied to the foregoing signals of announcement, but more closely associated with a particular event, is the signal called *kinit i a:fti* (the ghost/approaches), which announces the approach of members of a secret society. Women and non-members scatter wildly on hearing this signal and lock themselves within doors.

Unless one has lived among Melanesians, it is impossible to conceive the ritual importance of the pig in the lives of these people. This special ceremonial significance of the pig is reflected in a number of gong signals.

A funeral house (fel) with the nephew of the deceased on the roof. Note the log gong at entrance of fel.



A chieftain who is known to be preparing a feast rarely fails to let his neighbours know the exact number and sex of every pig which he has in his compound. As additions are made to his stock of pigs the facts are broadcast to the native world by means of the *sif um bo* signal. This signal consists of a number of dual beats followed by several quadruple beats. Two firm beats separated by a small interval are then made to indicate a boar. A sow is indicated by a final single beat. When the full number of pigs in stock has thus been indicated, a final concluding signal, called *sif ka:le bo*, is made.

At big feasts, huge stone ovens are built to cope with the large number of pigs on the menu. Before the ovens are uncovered, the chieftain in charge of the

feast rolls out on the gong a signal called *fa:sui*, by which guests and neighbours may know how many pigs lie cooking in the ovens.

One of the many duties which fall upon a feast-maker in Tanga is that of ensuring fine weather for the feast. This involves visiting each of the rain magicians in the neighbourhood and securing his promise not to make rain upon the appointed day. The natives *do not believe* that rain is not a natural phenomenon. However, they *do believe* that under certain circumstances Nature can be influenced by man, and therefore they take the appropriate precautions. I have been at a native feast when rain began to fall. The chieftain, who was sitting beside me, looked at the rain with a grim face for a few moments, and then, grasping the gong beater, he tapped out a most menacing challenge to the guilty rain magician. This signal was called *tut-turam-ba:t*, i.e., the signal/concerning/the rain magician. It was a warning to him to cease his evil doings,



Nephew of deceased person seated on two gongs receiving presents of shell valuables.



A native orchestra, showing lizard-skin drums which are purely musical instruments, never used for signalling purposes.

and on this particular occasion it was directed against a visiting man of importance from another island. Unfortunately, it had little effect on the weather, and I am afraid that that visitor would have some pretty serious explaining to do before he was invited to Boieng again.

On the death of a person of importance in Tanga, a signal on the gong called *tut-malangian-kinit* is rolled out by a brother of the deceased. The natives pointed out to me that it represented the death rattle—an explanation which suggests that some of the signals are imitative in origin.

Another signal connected with death is the *bis a: pinut*, which was the most dreaded gong signal known to the natives, for it indicated that one of their number was being hacked up in readiness for a cannibal feast.¹

The majority of the gong signals so far described are used on many different occasions, and may be described as fairly common features of the social life. On the other hand, those signals which are connected with the funeral ceremonies of Tanga are definitely part of the funerary ritual, and their main function is to regulate the tempo of each rite. For example, during the building of the funeral house a gong signal² is made to indicate

the completion of various stages. The final tightening up of the framework of the house is signalized by the beating of the *sif-ki-kiok*, whilst the act of filling the funeral house with presents of food is indicated by the signal called *sif una sing fel*. When the mourners come forward and place valuables upon those pigs which have been presented for the feast, another roll of the gongs is made,¹ and as the nephew of the deceased walks along the roof of the funeral house during one stage of the rites, his progress is announced by a special signal on the gongs.² On descending from the roof, another signal³ is made, and by these means the gong beater controls and regulates the rite.

This concludes our description of the audible, non-lingual means of communication in Tangan society. We have seen that the gongs are used not only to spread information, but to enhance prestige and regulate ceremony. Although it would seem probable that Tangan gong signals are allied to other New Guinea systems of signalling, yet I have not the slightest evidence of such a relationship, and I never once heard of a signal having been imported from another group.

¹ *Sif una tinge*, i.e., signal/connected with/the payment.

² *Sif una fel*, i.e., signal/connected with/the funeral house; or *sif u ia:t*, i.e., signal/connected with/him who is on the roof.

³ *Sok sok mus.*, i.e., beat/swiftly.

¹ See Bell, F. L. S., "Warfare in Tanga", *Oceania*, V, p. 274.

² *Sif una rokok un fel*, i.e., signal/connected with/the work on/the house.

An Appeal for the Preservation of Prehistoric Remains in Australia

By PROFESSOR JOSEPH L. SHELLSHEAR, M.D.

[*Editorial Note.*—In the belief that much information regarding Australian prehistory can be gathered by a careful and systematic study of the objects contained in cave and other deposits, the Trustees of the Australian Museum have organized a survey of the data available in New South Wales. This article, by Professor Shellshear, Honorary Archaeologist, is timely and useful, as it stresses the need for the preservation of the sites and objects, and also briefly sets forth the aims and methods of investigation.]

THE science of prehistory concerns itself with the history of man before there was any written record. Naturally, it is closely related to history derived from written records, and the clear line of demarcation between prehistory and history is not always easy to define. The object of both studies is to describe an orderly series of events so tabulated and arranged as to reveal proper chronological sequence, the essential culture of each period in its material, intellectual, and spiritual aspects, and the interrelations of cultures, their origins and such-like. Whilst historical study is not confined to written record, and incorporates evidences from material and other sources, the science of prehistory is of necessity confined to the

correct interpretation of the material objects found.

In the very nature of things these material objects are mostly found by excavation. The evidence lies buried in those sites where ancient man has found occupation. The layers of the soil in these ancient sites are, as it were, leaves of a book. But, unlike most books of history, the leaves have become scattered and disarranged. To read the book aright requires the labour many minds and hands. The services of the geologist, the ethnologist, the surveyor, the anthropologist, the botanist, the zoologist, the soil analyst, and many others are essential. There is no easy road into the science of prehistory. It is a discipline in exact method.

The excavation of a cave deposit at Goewa Lawa, Sampung, Malayan Archipelago. Every object unearthed is carefully plotted on charts of the horizontal and vertical surveys, and all data of stratigraphical value are accurately recorded. The specimens are the property of the Government and form a permanent record of the work in the national collection.

Photo.—Service Archéologique des Indes Néerlandaises.





An example of a collector's zeal. A number of carvings have been cut out of the rock in a large group near Balgowlah, as have paintings in rock-shelters at Cowan Creek, Wollombi, and other localities in New South Wales. Severe penalties for such wanton vandalism should be decreed by legislation.

Photo.—G. C. Clutton.

HISTORICAL.

The history of the development of this branch of ethnographic studies commenced with the discoveries of the evidences of early man in France in the early part of last century, and the science has always held an honoured place in that country. The careful and systematic use of exact method by the French savants has revealed to us the sequence of cultures in France, but as this work is familiar to all there is no need to enlarge upon it. From France the work has extended all over the world. It has fallen to the lot of the writer to have been able to visit sites in many parts of the world and to study the methods employed.

Although, naturally, in France in the earlier stages of the science the methods were not always the best that could be desired, the major sequences and cultures were worked out. Later, with increasing experience, subdivisions of the main cultural levels have been made. This work has laid a sound foundation for giving a chronological order, and has been of inestimable value to workers in surrounding countries. The emergence of the science from a stage which I have heard aptly described as "bandicooting" to the position of dignity which it now holds in France, has not been without its troubles. In the caves in the neighbourhood of Les Ezyies the beautiful mural decorations have been injured by the smoke of candles

used by early entrants, and by the carving and scribbling of names and initials.

Whilst France has thus rightly established for herself a reputation for scientific learning in prehistory, the story of Great Britain, with her local societies in almost every village, is, with a few notable exceptions, not creditable. The science has been almost completely neglected by her universities.

In Holland, excavations are being carried out by van Giffen in the vicinity of Groeningen. I was privileged to spend some time with Dr. van Giffen, and saw his methods of excavation applied to tumuli and to the opening up of old buried dwelling places. His methods should be the pattern for all excavation work. It is planned to reproduce every feature discovered. The works are surveyed by competent surveyors, and plans are figured in both the horizontal and vertical planes. The dwelling places which he is excavating belong to the period when the Anglo-Saxons lived in that part of Europe, and a flood of light is being shed on their early history. In other parts of Europe, such as Denmark, Germany, and Moldavia, the migrations of Europe's early peoples are gradually being worked out.

But within the last twenty years the centres of interest have tended to leave Europe, and we now recognize that early man and his culture were very widespread. In South Africa cultures very similar to the Mousterian and other

phases in Europe are being revealed. In Kenya, Leakey's researches demonstrate to us the importance of accurate method in a study which gives us the past history of mankind. His finding that *Homo sapiens* inhabited Africa at so early a period, if fully confirmed, will require a complete reorientation of our views on the evolution of man.

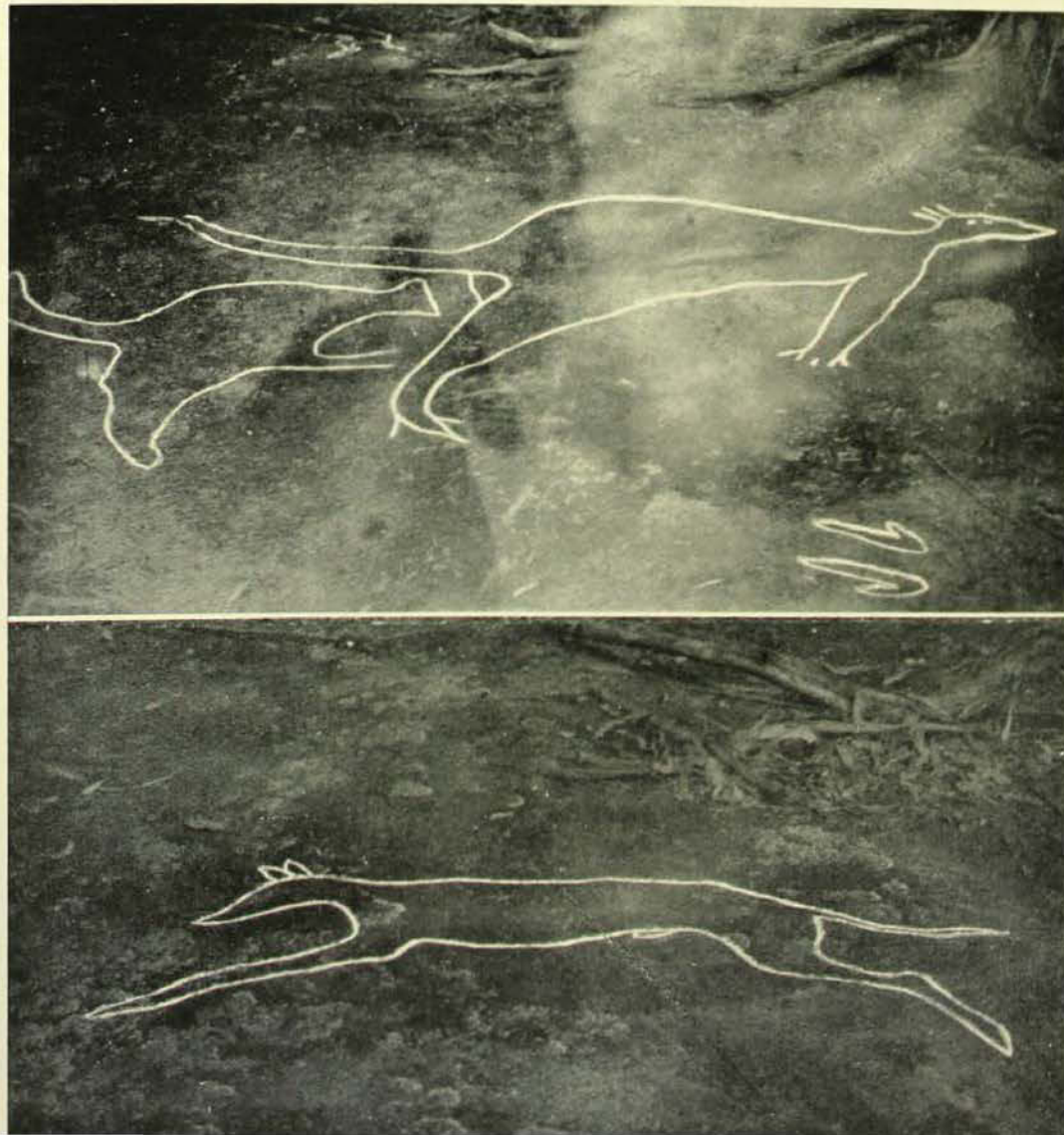
It is to the Orient, however, that we must turn to find the real romance of pre-history. There, many years ago, Dubois, a Dutch physician and anthropologist, startled the scientific world by finding the famous fossil *Pithecanthropus erectus*, the ape-man of Java. Concerning this fossil there has been considerable controversy, mainly because the discovery of the skull distracted the attention of those engaged in the search from the importance of keeping a proper record of implements, fossil bones of other animals and such-like associated with human remains.

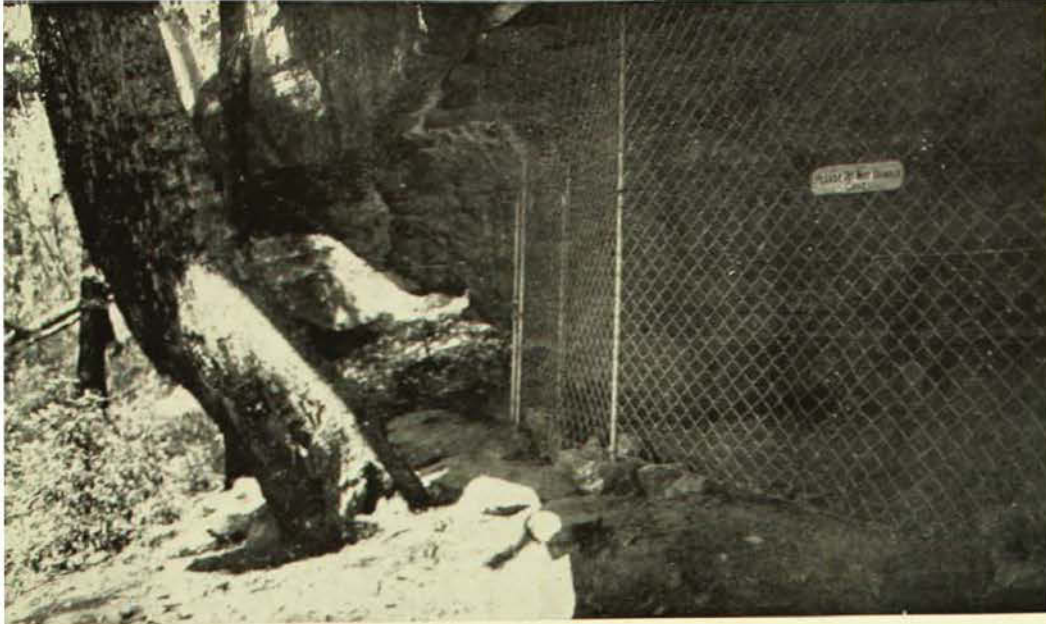
The work of Callenfels, van Es, Koenigswald and others has recently established the fact that *Pithecanthropus* belongs to the middle Pleistocene, and is therefore younger than was at first thought. At the same time, other discoveries of ancient man in Java, *Homo wadjakensis* and *Homo soloensis*, clearly prove the importance of the islands of the East Indies in the evolution of man.

The discovery of *Sinanthropus pekinensis* (the Pekin man) near Pekin was a fitting culmination to a most brilliantly conceived programme of prehistoric research carried out with punctilious care and accuracy. Nothing was left to conjecture. Where doubt may have existed concerning the use of fire or the nature of the stone implements, such men as the Abbé Breuil were called in. The final result has been that the facts recorded are accurate and have laid a sure foundation for future finds.

At Castlereagh a carving of a greyhound dog has been recently made near the aboriginal carvings shown in the upper picture. Another common act of vandalism is the addition of lines, thus distorting the carvings, and of chipping names and initials on the rock. Some aboriginal carvings are almost obliterated by hundreds of such personal records of visitors.

Photo.—B. L. Hornshaw.





The most effective method of protecting cave paintings is to erect steel wire screens, with a padlocked door, across the mouth of the cave, thus preventing access but allowing visitors to see the drawings. There is a large number of caves containing paintings in New South Wales, and it is hoped, with the co-operation of councils and local bodies throughout the State, to protect as many of them as possible. The above cave is at Glenbrook, Blue Mountains. Photo.—F. D. McCarthy.

The finding of *Pithecanthropus* and *Sinanthropus* is only a minor part of the work which has been done in the Far East. In French Indo-China the scientists of the *École Française* have investigated a vast number of prehistoric sites from palæolithic to neolithic and bronze ages. Successions of cultures have been so well defined that direct comparisons may be made with the cultural levels in Java, the Philippine Islands, the Celebes, and other places in the Far East. In Malaya, Dr. Stein Callenfels is at present working on sites which have a definite Australoid facies, and which are similar in many respects to the earlier cultures of Indo-China defined by Mlle. Colani. In the Philippine Islands, Dr. Ottley Beyer has discovered practically every stage of the development of human cultures from the early palæolithic in an almost unbroken series to the late iron age.

In Java the model of prehistoric research is the excavation of the Sampoeng cave by Dr. Stein Callenfels. The methods employed are so accurate that the smallest objects are not only found, but can be stratigraphically placed by means of horizontal and vertical survey.

Finally, I would briefly refer to the work on the early period of Chinese history, which had its inception in the finds made by Dr. Heanley and myself in Hong-Kong. I refer to this to express the tragic loss to prehistory in China in the untimely death of Father Finn, S.J. His writings on the Hong-Kong cultures found in the *Hong-Kong Naturalist*, are sufficient evidence of his profound knowledge of early Chinese cultures.

AUSTRALIAN PREHISTORY.

All these discoveries have a very peculiar interest to Australia because here we still have palæolithic types of cultures having points of similarity with cultures long since gone from other countries. The similarities in many cases are so close that they cannot be merely fortuitous. Furthermore, the Carnegie Trust is at the present time financing excavations in Malaya on cultures which bear close similarity to the Australian. In Java, more and more specimens of early man are being discovered, and knowledge is required concerning their affinities with the aboriginal Australian. The prehistory of Australia is unknown and unexplored. There is open a field for investigation which must produce results of first importance, and, furthermore, Australia owes it to the world of science to do something about the matter. We owe it because of the debt which we have contracted in the great mass of other scientific knowledge which we have taken from other countries. In certain aspects of anthropology, work has been done. Sir Edgeworth David and other geologists have already laid the foundation of the knowledge on which the further superstructure of detail will undoubtedly be added. Such work is the basis of all prehistory. Spencer and Gillen, and other enthusiastic workers, have recorded much ethnological detail of the highest value. Campbell has given us a record of the rock carvings in the Sydney area, and this should be supplemented as soon as possible before these artistic remains are lost or defaced.

Milne has given us a valuable and comprehensive account of the tree carvings, and, finally, I would refer to the work of Roth in placing on record so much on aboriginal customs.

More recently the researches of Professors A. R. Radcliffe-Brown and A. P. Elkin, and the field workers of the Australian National Research Council, are of great value, as is the work which is being done on the Australian aboriginal by the Adelaide group of workers.

Thus a certain amount of very valuable work has been done on the present living aboriginal; but prehistory deals with the early migrants to this country. The story of prehistoric research in Australia is deplorable. There is happily one piece of work, however, which opens up an avenue of hope. This is the work of H. M. Hale and N. B. Tindale, of the South Australian Museum, Adelaide; and I shall discuss it merely to emphasize the seriousness of the situation.

Hale and Tindale in their paper, "Notes on Some Human Remains in the Lower Murray Valley",¹ give an account of their excavation at Tartanga in which the scientific method is admirable. The paper starts with proper maps showing the general position of the sites, followed by a clear account of the geological horizons. The leaves of the book have

¹ Hale and Tindale; *Rec. S. Austr. Mus.*, IV, 2, 1930, pp. 145-218.

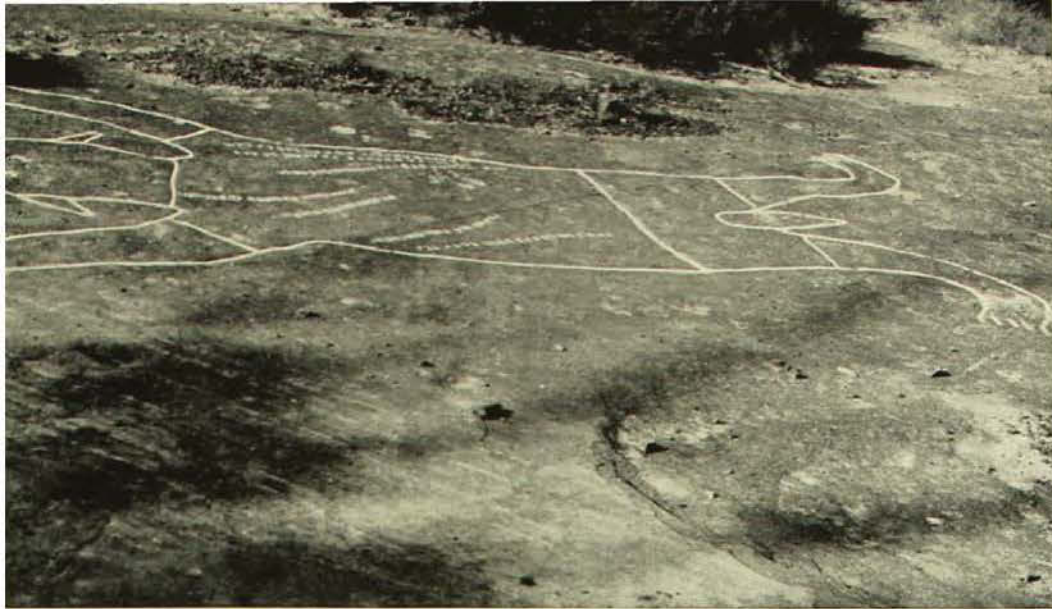
been carefully handled, and from a critical analysis they have been able to define a group of different cultures belonging to different stratigraphical levels. The only possible criticism of this work which could be made, is the absence of horizontal and vertical surveys, but this has not affected the accuracy of their conclusions, because they were fortunate in that the different cultural levels were clearly indicated in the differences in colour of the soil. This work must provide the foundation for all future excavatory work. I would emphasize, however, that it is deplorable that this valuable site was not at once protected from the vandalism of private collectors.

As a preliminary to making an investigation into the prehistory of New South Wales, I undertook to make a survey of possible sites for the Trustees of the Australian Museum in Sydney. With the assistance of Mr. F. D. McCarthy and Miss E. Bramell, M.A., of the Department of Anthropology, a complete survey was made of rock shelters, kitchen middens, rock carvings, and other features on the shores of Port Hacking, George's River, the Hawkesbury River, and the Gosford and Newcastle areas. In all, we travelled approximately three thousand miles and visited over four hundred rock shelters. The rock shelters of the Sydney area are ideal for the purpose of scientific excavation, yet of the four hundred shelters

Many visitors to aboriginal cave paintings scrawl their names and initials over the drawings, wholly ignoring the scientific and historical value of the paintings in their desire to record their visit. Such relics of the aborigines form an important record of their art, life and customs, and should be preserved for posterity.

Photo.—G. C. Clutton.





A large carving of a tribal spiritual ancestor or culture hero which forms part of a large and important group at North Maroota. The right hand and arm have been almost obliterated by the vehicle tracks (which may be seen in the left foreground). This is only one example amongst many of groups of aboriginal carvings which are being destroyed in a similar way.

Photo.—F. D. McCarthy.

very few are possibly in a fit state to explore, a few more are doubtful, and the remainder useless. Little effort is being made to preserve either the rock carvings or the cave paintings. The rock carvings are in many places defaced by initials carved in the rocks, at North Maroota a motor track passes over the rock where the most beautiful carvings are exposed, and in other places carvings of modern animals have been made alongside aboriginal carvings. The cave paintings have been defaced by the scribbling of names and by the smoke of campers, and have even been cut out of cave walls.

Whilst it is obvious that steps will have to be taken to preserve what is left of the aboriginal remains, as has been done by the legislature in other countries, it is of interest to analyse the causes of this wholesale destruction. This is done not to offend those whose collecting efforts are laudable, but in the hope that some thought will be given to preservation not only in New South Wales, but also in other States.

The defacement of national monuments by scribbling and carving of names can only be attributed to a low level of intelligence, and should be an interesting theme for the psychologist, but has no place in this paper. I have seen it in all parts of the world.

Apart, however, from this sheer vandalism, the cause of the destruction of pre-historic material in New South Wales is the collecting of implements. These may be found in the open, on middens near the coast, or in rock shelters. The middens on the coast cover large areas,

and as a rule have little depth. They are being continually disturbed by shifting sand, and can have little or no stratigraphic value. On the other hand, the middens on the foreshores of the Hawkesbury and other rivers are often of considerable thickness. These, unfortunately, have mostly been destroyed in the past by lime burners and oyster lease owners. There remain the rock shelters which should have yielded good scientific results, but which, unfortunately, have almost without exception been dug into.

This state of affairs is not confined to Australia, and the harm done to the progress of science can be best illustrated by quoting from a paper by Fisher:¹ "The [Oruarangi] site was dug over by a private collector, who obtained an extensive series of adzes, fishing sinkers, tops and numerous other stone articles. . . . Unfortunately, systematic stratigraphical details were not kept, and it is only possible *now* [*italics mine*] to give descriptions of the articles recovered."

The question might well be asked: Why do men collect these relics of ancient man? There are many reasons: Firstly, they are collected for personal gain. There is an exaggerated idea of the value of stone implements and a fictitious price is put on them. Recently I saw an implement in a shop window in Sydney, and in curiosity I asked its price. I found that fifteen shillings was being asked for the implement, although the vendor had no idea of its place of origin. It was quite a common type, and certainly would

¹ Fisher: *Records Auckland Museum*, I, pts. 5, 6; II, pt. 1, 1934-6.

have been over-valued at 6d. Again, there is a certain amount of dealing with outside countries, despite the fact that there is provision made to prevent export. This matter should be examined, as there is provision for exchange between museums.

Secondly, there is the collecting of implements for the intrinsic interest attached to them. In Sydney (I cannot speak for other parts of Australia) the collectors have had their interest mainly centred on the implements, and subsequently have missed the more interesting cultural aspects of the problem. I have found throughout the survey of the sites in New South Wales that a large body of men are interested. I have come into contact with many who have destroyed rock shelters, and, with few exceptions, they have been more than ready not only to admit the mistakes which they have made, but also to do their utmost in the future to preserve to posterity prehistoric remains.

It must be remembered that twenty or thirty years ago, and even more recently,

the importance of artefacts as indicators of cultural relationships, and the necessity for careful collecting and recording of all associated facts, particularly as regards succession in time, was not fully realized. Institutions and individuals devoted themselves to the collecting of objects without due regard to their cultural and historical significance, but unquestionably their activities resulted in the assembling in our national museums of much material of great value.

Whilst I hold that it is a matter of educational value that schools should develop local museums, I consider that it is of greater importance to educate the young not to destroy when they collect. The official interest in the preservation of the fauna and flora of this country gives hope that attention will be paid to the preservation of aboriginal material.

But above all this, public sympathy and co-operation in the preservation of the remnant that is left are what is most required; without this our aim cannot be achieved.

BUSH RAMBLES. By A. G. HAMILTON.
(Angus & Robertson Ltd., Sydney,
1937). Pp. 253, 9 photographs.
Price: 6s.

This veteran naturalist, so well known to all Australians who take an interest in our fauna and flora, has been well advised to issue in this volume the series of articles which first appeared in the *Sydney Quarterly Magazine* about fifty years ago. Their interest and value have not lessened with the years, but have even increased, for in some respects drastic changes in natural conditions have taken place in the interval, and the book is a record of things as they were but are no

longer. Not today in New South Wales would one be likely to stumble on the nest of a Rat Kangaroo.

Mr. Hamilton is both zoologist and botanist, and, being a close observer, he has amassed much knowledge regarding the plants and animals of the bush and the seashore, which he imparts in an interesting and quietly humorous manner. Of *Bathybius* on the ocean floor and the eagle soaring over the tree tops, of the lowly lichen and the forest giant, he writes in a chatty and informative style, with many an aside and apt quotation for full measure.

C.A.

Quartz

By T. HODGE-SMITH

NO mineral is so widely distributed as quartz in one form or another in the rocks of that part of the earth's crust close to the surface, or as much of it as we can examine. It is composed of silica, which is a very simple chemical compound consisting of one atom of silicon combined with two of oxygen. Beside occurring in nature in the free state as various varieties of quartz, silica is also found in the combined state, forming a large group of

minerals known as silicates, and it has been estimated that silica constitutes nearly sixty per cent. of the upper portion of the earth's crust.

The number of different purposes for which man has used quartz is legion. Quartz implements include the crude stone knives of primitive man and the highly technical optical lenses of his more civilized brother; it is used in medicine and magic, and as a building stone (sandstone); in the refractory materials of the



A group of Quartz Crystals from the Conrad Mine, Howell, New South Wales.



*A crystal of Quartz
with arborescent
Bismuthinite (Bis-
m u t h sulphide)
from Kingsgate,
New South Wales.*

smelter and in the manufacture of glass; as an abrasive and as a semi-precious and ornamental stone.

It is quite impossible to deal with all these different aspects of quartz in a short article such as this, so we shall confine ourselves to crystallized quartz, considered as a semi-precious and ornamental stone. Nor is it possible to deal with chalcedonic quartz, which forms the second main division of silica minerals.

The first division includes all ordinary quartz with a vitreous lustre, whether having crystal faces or not. When it does occur as crystals they are usually in the form of six-sided prisms capped by six-sided pyramids. Sometimes the prism is very short or even entirely absent, when the crystal appears as a double six-sided pyramid. Small pyramidal crystals of quartz are sometimes mistaken for diamonds, but if it is found that the pyramids are six-sided no further tests

are needed, for a pyramidal crystal of the diamond is four-sided.

Under the term crystallized quartz are included a number of varieties, such as rock crystal, amethyst, rose quartz, smoky quartz or cairngorm, silicified crocidolite, and aventurine.

Rock crystal is the purest form of quartz and is colourless or nearly so. It sometimes surpasses the diamond in transparency, but is greatly inferior to it in lustre and hardness. It was well known to the ancients, and, as far back as 300 B.C., Theophrastus recorded the fact that rock crystal was one of the stones used in rings.

Among the Romans it was used for the purpose of making drinking cups, vases, bowls, and similar articles, which were embellished in much the same way that their modern cut-glass representatives are today. They also used the material for making solid finger rings cut out of a

single piece. Crystal balls are commonly found amongst ancient remains, and they had three entirely different uses. They were used as magic mirrors for foretelling the future, the Roman ladies carried them in their hands during the heat of summer because of their delightful cooling effect, and they were also used as burning lenses. The following extract from Aristophanes' "Clouds" indicates a useful application:

Strepsiades: You have noted
A pretty toy, a trinket in the shops,
Which, being rightly held, produces fire
From things combustible?
Socrates: A burning glass
Vulgarly called?
Str.: You're right, 'tis so.
Soc.: Proceed.
Str.: Put now the case: your scoundrel bailiff
comes.
Show me his writ. I, standing thus, d'ye mark
me,
In the sun's stream, measuring my distance,
guide
My focus to a point upon his writ,
And off it goes in fumo.

Curiously enough, the ancients did not ascribe any medicinal properties to the crystal except that if powdered and mixed with wine and honey the mixture, if taken by mothers feeding their young, was thought to be most beneficial. Rock crystal appears to have been highly prized for making burning lenses for lighting sacrificial fires, the flame so kindled being called the fire of Vesta.

The common belief of the ancients was that rock crystal was ice permanently frozen, so to speak, by intense frost, and it actually received its name from the Greek word for ice. One of the probable reasons for this belief, apart from the appearance of the mineral, was that the material was obtained from the high peaks of the Alps, the coldest region known to these people. Further support was found in the fact that the crystal often contained cavities partly filled with water. We now know that silica is contained in solution in certain underground waters which, on reaching the surface as a spring or geyser, deposit the silica as sinter, as in the case of the famous pink and white terraces of New Zealand. Under certain conditions silica is deposited from

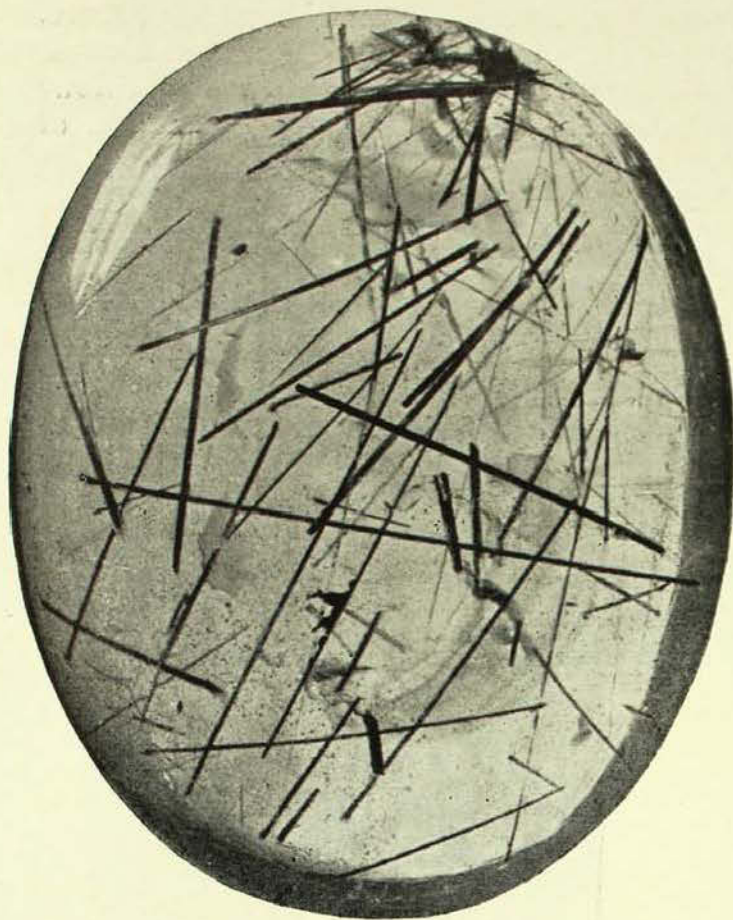
these solutions in underground cavities as veins and pipes of quartz, and the liquid found in the cavities of the rock crystal is really a portion of the original solution imprisoned in the cavities formed during the deposition of the crystal.

AMETHYST.

Amethyst is really only a colour variety of rock crystal, though it is often cloudy. The colour varies from reddish-violet of pale shade to the deep rich tones of pure violet, and is probably due to an admixture of a manganese salt so small in amount that it is not possible to detect the grains of this compound with the highest power microscope, nor is it always possible to separate the manganese by chemical means. Most people have seen the way in which a colourless glass bottle, thrown out on a rubbish heap and exposed to the sun's rays for a considerable time, assumes the true amethyst colour. In the first place, manganese is added to the glass to counteract the colour produced by an iron salt, and during its long exposure to the sun the violet coloured salt of manganese is developed by oxidation.

It was formerly thought that the presence of some organic compound was responsible for the colour because it was destroyed on heating, first turning yellow, then assuming a greenish shade, and finally disappearing. This property has been used to convert the common amethyst into the rarer yellow variety of quartz, citrine. In fact, it has been suggested that all citrines are only burnt amethysts, and that it is doubtful whether true citrine does occur in nature. The effect of heat is also used in bringing a number of stones to the same shade so that they will match more perfectly.

The ancients prized this stone very highly, but it is probable that beside the modern amethyst they included a number of other minerals with similar colour, such as certain varieties of sapphire, garnet and spinel. The name is derived from a Greek word meaning "not drunken", and it was supposed to pro-



Quartz with inclusions of crystals of Rutile. The brown colour of the Rutile gives the impression of dried grass; hence the term "grass-stone" which is applied to such occurrences. Tingha, New South Wales.

tect its wearer from drunkenness. Cleopatra is said to have worn an amethyst ring for this purpose. Mohammed Ben Mansur affirmed that wine drunk out of an amethyst cup does not intoxicate.

In view of the present-day cheapness of the stone it is of interest to note that £2,000 was paid for an amethyst necklace for Queen Charlotte in the eighteenth century.

SMOKY QUARTZ.

Smoky quartz is another colour variety of quartz, varying in colour from nearly colourless through various shades of brown to almost black. The transparent varieties make a rather effective gem, and are sometimes erroneously called "smoky topaz". In Scotland the brown variety occurs at Cairngorm, a mountain on the borders of Banffshire and Invernessshire, and the stone has received the name

of cairngorm. It is invariably used in the decoration of the national costume of the Scottish Highlander.

The discovery, in 1868, of a crystal cave in weathered granite near Tiefen Glacier, Switzerland, was productive of perhaps the most remarkable occurrence of smoky quartz in large crystals so far known. Twenty tons of beautifully transparent crystals suitable for cutting were collected from this one cave. One of the crystals measured two feet three inches in length and four feet two inches in circumference.

When the colour is almost black in thick pieces the stone is sometimes known as morion. The colour of smoky quartz is due to the presence of a volatile organic substance which has actually been distilled off as a turbid liquid. If strongly heated, smoky quartz becomes colourless, and is then indistinguishable from rock crystal. As with amethyst, at low temperatures the colour is changed to yellow and the stone then closely resembles citrine.

QUARTZ WITH INCLUSIONS.

It has been noted that in the colour varieties of quartz the colour is due to very finely divided particles of a foreign substance. Sometimes quartz may include a foreign substance that occurs in crystals large enough to be seen with the unaided eye. When these inclusions take the form of fibrous or needle-like crystals they are often cut and are then known under various names, such as hair-stone, grass-stone, cat's eye, tiger's eye, etc.

Grass-stone derives its name from the needle-like crystals of reddish-brown rutile, an oxide of titanium, and is found rather plentifully in the New England District, New South Wales. Some of the miners there will not be convinced that the crystals of rutile are not dried grass, which they certainly do resemble. As a matter of fact, one of them showed me a specimen in which the crystals of rutile were so arranged as to represent rather well the form of a grasshopper. He

treasures this specimen and produces it as absolute proof of his contention.

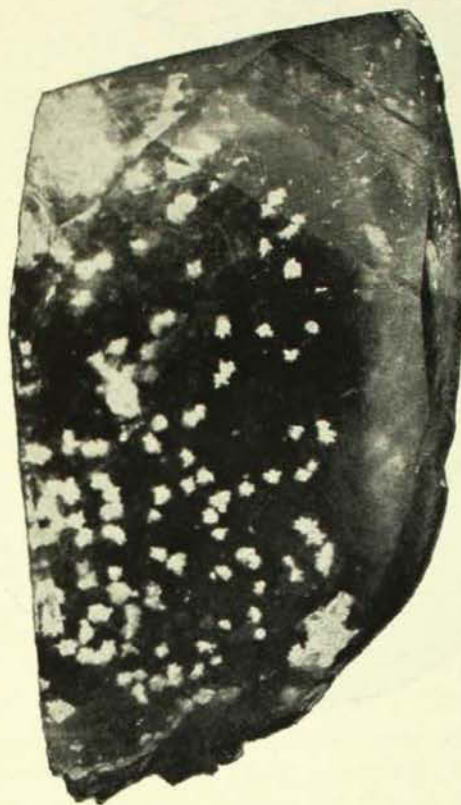
Hair-stone derives its names from hair-like fibres of green actinolite, white asbestos (Thetis's hair-stone), or rutile (Venus's hair-stone), that occur as inclusions in the quartz.

The fibrous structure of cat's eye is due to inclusions of a large number of fibres of asbestos in parallel position, which give to the stone a chatoyant lustre. When cut *en cabochon* a band of light at right angles to the fibres is seen, giving the appearance of the shining eye of a cat.

The highly prized oriental cat's eye is not, however, a variety of quartz, but a variety of chrysoberyl, an aluminate of beryllium. The cat's eye was known to the ancients, but it is not quite certain what mineral they referred to by this name. Ben Mansur placed it under the name of *znilaces* sixth in his scale of values, next to the diamond.

Tiger's eye is really an altered fibrous mineral known as crocidolite. The unaltered mineral is blue to green in colour, and is a somewhat complex silicate of sodium and iron. The conversion into tiger's eye is due to the oxidation of the iron and infiltration of silica without in

any way altering the fibrous structure. The compact siliceous stone so formed possesses bright yellow and brown colour bands at right angles to the direction of the fibres.



Inclusions of small white tufts of Tremolite in a crystal of smoky Quartz. Tingha, New South Wales.

THE EMPEROR OF THE ANTS. By "VAMBA" (LUIGI BERTELLI). (Angus & Robertson Ltd., Sydney, 1937.) Crown 8vo, pp. 223, illustrated. Price: 6s.

This is one of those rare books for children which is instructive, yet written in so entertaining a manner that it can be read with enjoyment by adults as well as by the young. The opening of the book describes how three children, sentenced to pore over lesson-books on a hot summer day, wish that they might change places with the apparently care-free members of the insect world. No sooner are their wishes expressed than a queer old magician transforms the children into a

butterfly, a cricket, and an ant, respectively.

The book is packed with authentic natural history lore woven into an enthralling tale, and lightened with much droll humour. The pen and ink drawings with which the story is lavishly illustrated, are extremely diverting.

The book is a translation by Nicola di Pietro from the Italian, but much of the information it contains is of a general nature and applies to many typical Australian insects. Nevertheless, at times a slightly stilted sentence or unfamiliar phrase makes one regret that no Australian author could be found for a book of this type.

N.B.A.