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Scarlet Honeyeaters

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THE AUSTRALIAN MUSEUM

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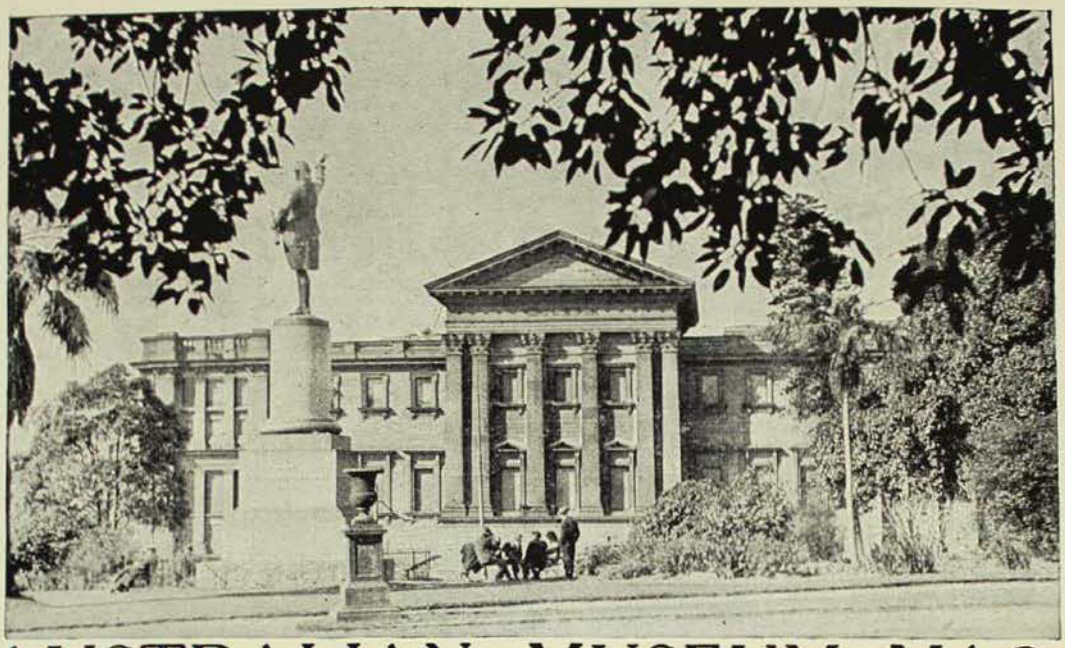

THE AUSTRALIAN MUSEUM MAGAZINE

■ OUR FRONT COVER. Scarlet Honeyeaters (*Myzomela sanguinolenta* Latham) is by Lilian Medland. It is one of the series of postcards issued by the Australian Museum.

This beautiful bird is also known vernacularly as the Sanguineous Honeyeater or Blood-bird. It ranges from Queensland to Victoria, moving southwards during the spring. Its song is remarkably sweet and clear, and may be heard at any hour, even in midday heat when most birds are silent. It may often be seen feeding amongst the blossoms in our parks and gardens. Its nest, which is constructed of bark fibres and cobwebs, is small, cup-shaped and fragile. The eggs are generally two; their ground colour is white with distinct spots or blotches of yellowish- or reddish-brown.

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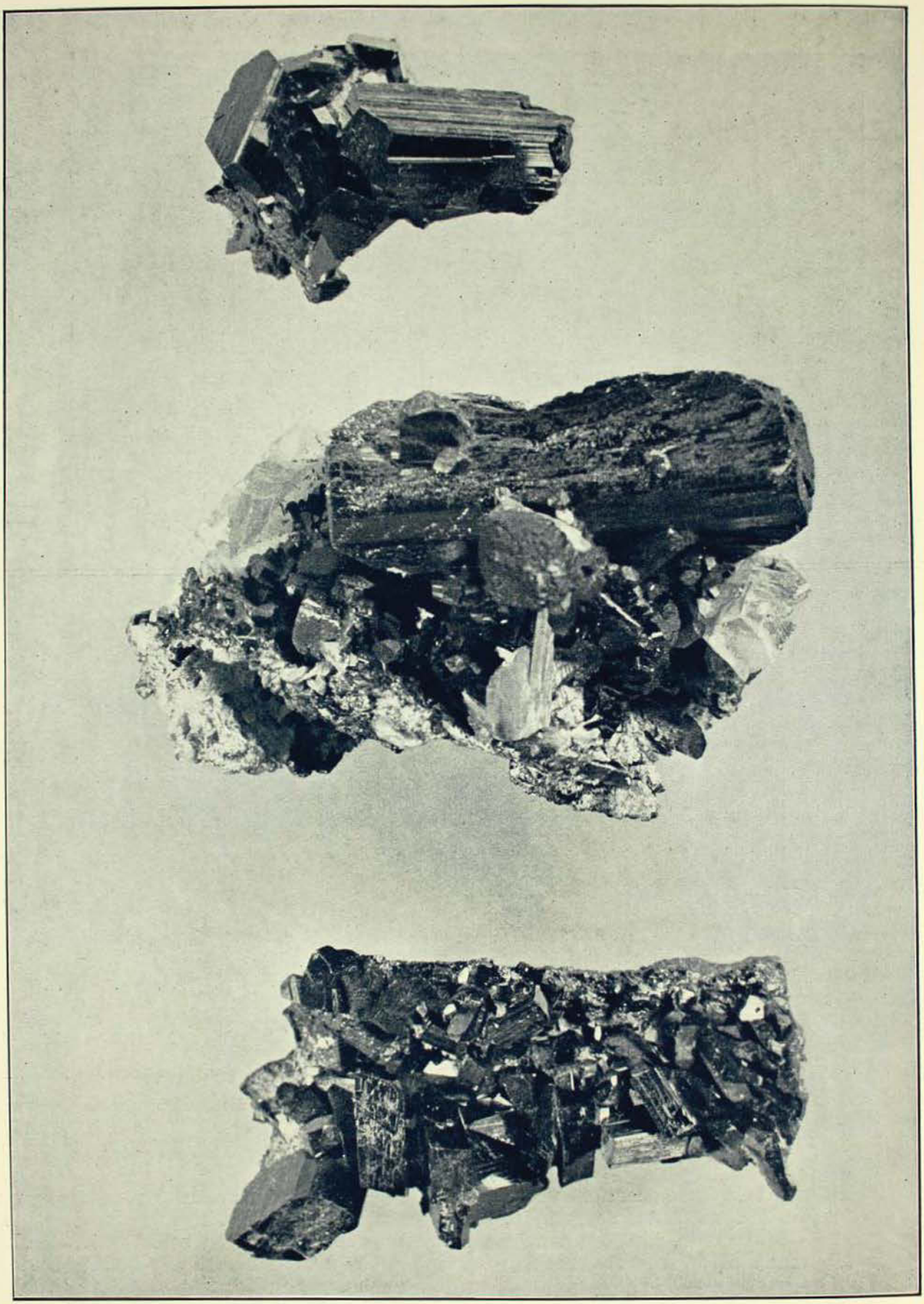

Azurite Crystals from Broken Hill.

[Photo.—*E. A. Bradford.*

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A Recently Acquired Collection of Minerals

BY T. HODGE-SMITH.

THE Trustees have recently acquired by purchase a collection of minerals which represents the life-time gatherings of the late Richard Eustice, who came from England in 1873 to join the staff of the Burra Mine, South Australia, where he remained until the mine closed some four years later. From 1877 to 1911 he was employed as engineer in charge of ore concentration, and chief surface officer to the Moonta Mine, South Australia. During this period he paid several visits to Broken Hill, New South Wales, where he erected the first sulphide jigg for the South Mine. In 1896 he superintended the erection of the concentrating plant for the Broken Hill British Proprietary Mine.

From this brief account of the career of the late Mr. Eustice it will be seen that he had a wonderful opportunity to collect in these districts before the oxidized zones of the mines, with their marvellous wealth of secondary minerals, had been stripped by mining operations. His collection, of which the Trustees secured some four hundred and fifty specimens, clearly shows that he took every advantage of this opportunity, and that he was a discriminating collector who prized rarity and beauty above everything.

Space will not permit a description of the many fine specimens that are included in the collection, but a few notes on some of the more striking ones may be of interest.

His collection of azurite from Broken Hill, New South Wales, contains some of the finest specimens of that mineral so far added to the Museum collection; certainly none from Broken Hill, previously possessed, can equal them. Three of these specimens are illustrated in the frontispiece of this issue. The centre one contains a crystal measuring three and a quarter inches by one and a quarter inches by three-quarters of an inch, and is by far the largest crystal in the Museum collection from Broken Hill. There is only

one crystal that can compare with it, and that one comes from the Girofla Mine near Chillagoe, North Queensland, and it measures three inches by three-quarters of an inch by half an inch. Unfortunately, as is often the case with outsizes in crystals, it is not perfectly formed. However, this is compensated by a number of groups, two of which are illustrated, in which the individual crystals are beautifully lustrous with well defined faces. The white mineral with the large crystal is cerussite, a carbonate of lead. A rare mineral, iodyrite, which is an iodide of silver, is associated with azurite in some of the specimens. In a number of cases crystals of azurite have been replaced either partly or wholly by malachite.

Azurite derives its name from its beautiful azure blue colour, and is a hydrous copper carbonate, or, more correctly, a basic cupric carbonate. It has a very close relative in malachite, which is also a basic cupric carbonate and differs in composition only in that it contains a little more copper and water. The colour of malachite is a bright green, and the two minerals are commonly known as the blue and green carbonates of copper. As the former contains 55·2% of copper when pure, and the latter 57·4%, they are both important ores of copper. Both minerals are confined to the upper levels of a mine, and owe their existence to the alteration of primary copper minerals, such as copper pyrites, by surface waters. Incidentally, the collection contains a number of delicately compact fibrous forms, from the Burra Burra Mines, showing peculiar colour banding. This form of malachite is used for ornamental purposes, and the Burra Burra malachite was world renowned for its beauty.

A very fine series of crystals of chalcopyrite, or copper pyrites as it is more commonly called, associated with crystallized quartz, is also included in the collection.

Perhaps no locality in the world has been productive of more mineral species than Broken Hill, New South Wales. Many of these are extremely rare, and one of the rarest is marshite, an iodide of copper. An excellent specimen of this is included in the collection, consisting of perfect little colourless crystals seated on ferruginous matrix.

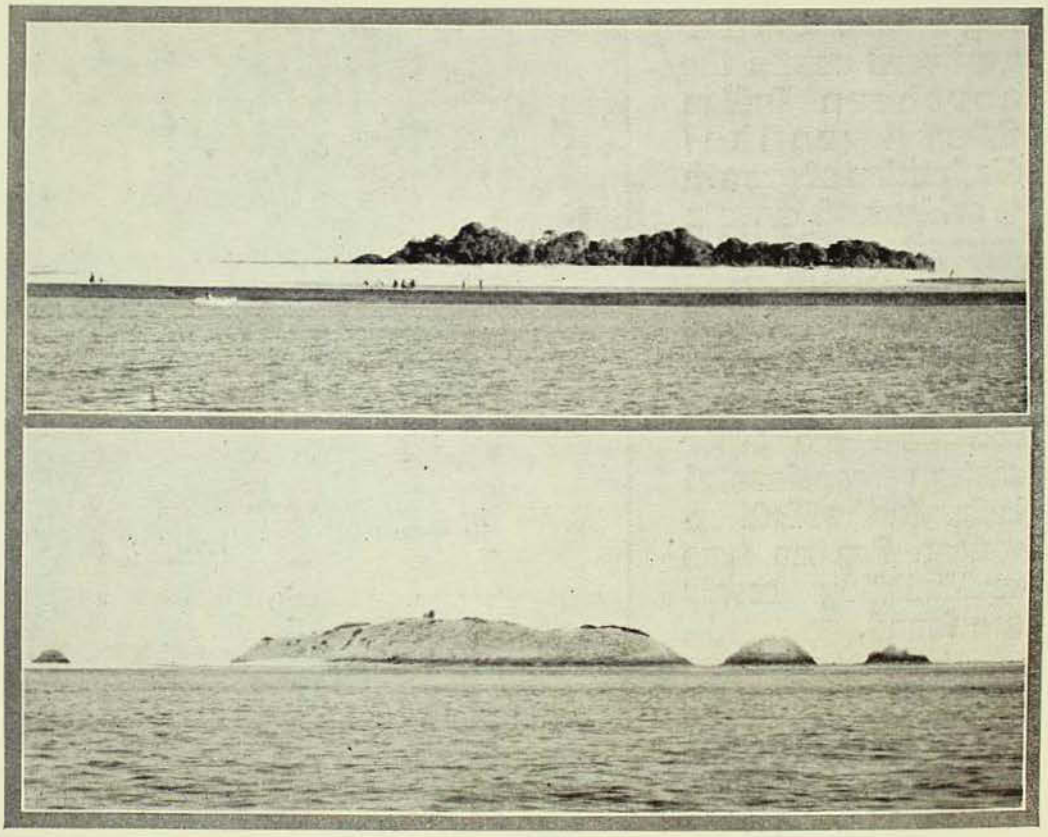
A large series of iodyrite and embolite (chloro-bromide of silver) from Broken Hill illustrates the association of these minerals with others. Other rare Broken Hill minerals include stolzite, the tungstate of lead, wulfenite, the molybdate of lead, and pyromorphite, the chloro-phosphate of lead.

One pleasing feature of the collection was the care that had been taken in preserving the specimens from damage. Perhaps a word of advice to those who possess mineral collections would not be out of place here. The most important thing about a collection is to see that each specimen has a label which must bear the locality from which the specimen was obtained. The lack of this important item is common to many private collections, and from a Museum point of view makes the collection practically valueless. Many people do not realize the importance of protecting specimens from damage. Undamaged crystals may be very valuable, but any damage at all enormously decreases their value. When it is necessary to transport a collection, delicate specimens should first be wrapped in soft tissue paper, then covered with cotton wool, and finally wrapped in ordinary paper. Other specimens should be wrapped in plenty of paper; too much cannot be used.

Coral and the Great Barrier Reef

By Frank A. McNeill.

CORAL has always been a word of romantic associations. To the modern it suggests the atmosphere of the tropics, of waving palm-trees, trade winds, and blue lagoons. In past generations, when the mystic South Seas were known mostly only to sailormen, the word conjured up visions of adventure and explorations in the little known lands of savage peoples. Because of all this, and also for the beauty of form displayed by coral, specimens have ever been cherished souvenirs in the home. These decorative fragments, however, are only the bleached limy skeletons of the live growth which once reposed in the colourful setting of its native reef. It is to the marvel of coral growth, and the massive limy beds it has created, that we must turn for the material facts which vie with the romantic in the intensity of their interest.



Upper: **Bushy Island, forty-six miles east of Mackay, Queensland, is a miniature cay only five acres in extent. The picture illustrates the low flat nature of the coral mound, and the typical appearance of cay verdure.**

Lower: **In striking contrast to the coral cay above is the nearby group of basaltic knolls constituting Tern Island, and rising to three hundred feet above sea level. As with other similar islands of continental formation off the coast of Queensland, a fringing reef encircles this island group.**

[Photos.—*Otho Webb.*

As reef-building corals are encountered only in the warm seas, we find that the warmer the water the more luxuriant is the growth of the bed or reef which they create. By a strange coincidence, there are cold currents operating along the western shores of continents, so that, generally speaking, it is only along their eastern seaboards that the full display of reef architecture, coral atolls, and lagoons is found. Hence it was that the West Indies area of the Atlantic Ocean first became known as possessing these features, the beauties of which were lauded by early writers. Subsequent knowledge, however, has shown that the coral growth there does not attain perfection, and numerous kinds of coral which once graced the waters of the Caribbean Sea have been relegated to the geological past. Varieties akin to these were ultimately found to exist in the

waters of the Pacific, as that great ocean gradually yielded its secrets to the explorer. Therefore, to discover the full development of coral growth one must leave the Atlantic and travel many thousands of miles westward to the region bounded roughly by the Philippines, the Solomons, and Papua. Further westward across the northern Indian Ocean a gradual diminution of growth is evident. A certain amount of development is present along the east African coastline, but this suffers by comparison with the other eastern continental beds. In the Mediterranean Sea no true reef-building corals are found.

Upper: **Masthead Island in the Capricorn Group is one of a series of islands of coral formation. The extensive surrounding reef has been bared by the receding tide.**

[Photo.—*A. R. McCulloch.*

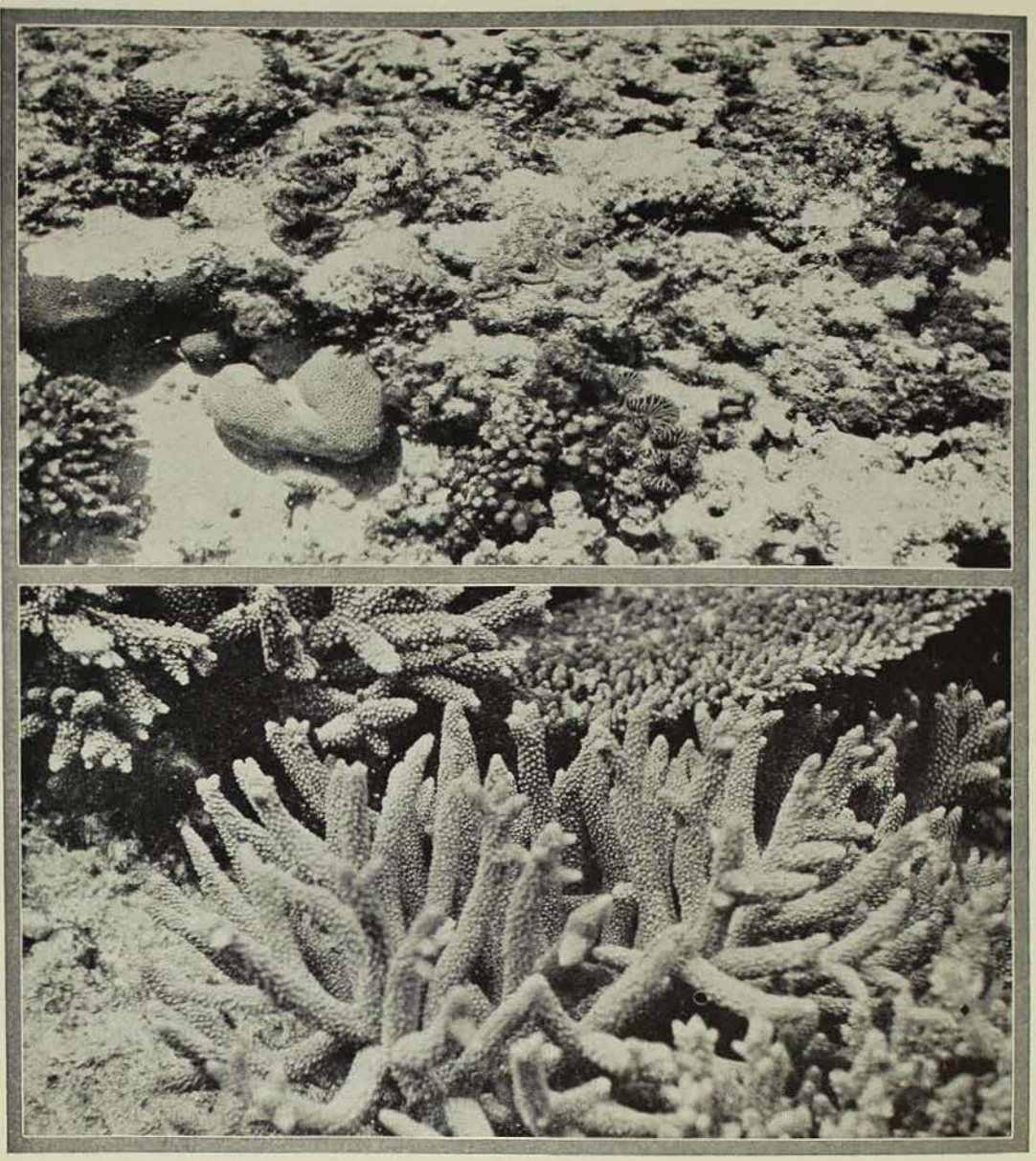
Lower: **At the edge or crest of a reef, the fused dead coral is so solid in structure that superficially it appears very much like the continental rocks of the mainland.**

[Photo.—*Embury Brothers.*

GREAT BARRIER REEF.

The greatest single structure ever achieved by the coral is the Great Barrier Reef of Australia. This mighty natural wonder is one of the finest heritages of our land. Northward from approximately the Tropic of Capricorn the vast coral field extends for over a thousand miles along the coast of Queensland, and penetrates beyond to the wide waters of the Gulf of Papua. Towards the southern extremity the influence of the colder water becomes apparent in the gradually diminishing growths. Here the varieties of coral become noticeably fewer, the reefs contracted and separated more widely from one another as the lowering temperature represses their growth vigour

and finally extinguishes them. At its northern limit the Great Barrier Reef terminates much more abruptly. Following on the great cyclones which have raged along the coast of Queensland, huge areas of dead coral have appeared. Thus it has been learned that freshwater and the silt from flooded rivers are as much the enemy of coral as is cold. Pouring into the Gulf of Papua are the waters of numerous large rivers which tumble down from the high mountain ranges of New Guinea. The silt and freshwater from these streams extends far out to sea, to form what may be termed the mud-line which limits the coral isles of the Great Barrier Reef. Along its eastern border also the Great Barrier is sharply defined. From the coast of Queensland a twenty to eighty mile wide shelf or sunken land mass extends to the edge of the Coral Sea. Along this margin rears the seaward rampart of the Great Barrier, while beyond, the shelf steps sharply down to the deep ocean bed.



Upper: **Bedded deeply in the coral base on the crest of reefs many small clam shells with brightly-hued fleshy mantles are to be found. In more or less sheltered crannies and along protected ledges hardy corals maintain a precarious existence.**

Lower: **Living staghorn and fan-shaped coral in the quiet waters of a reef pool.**

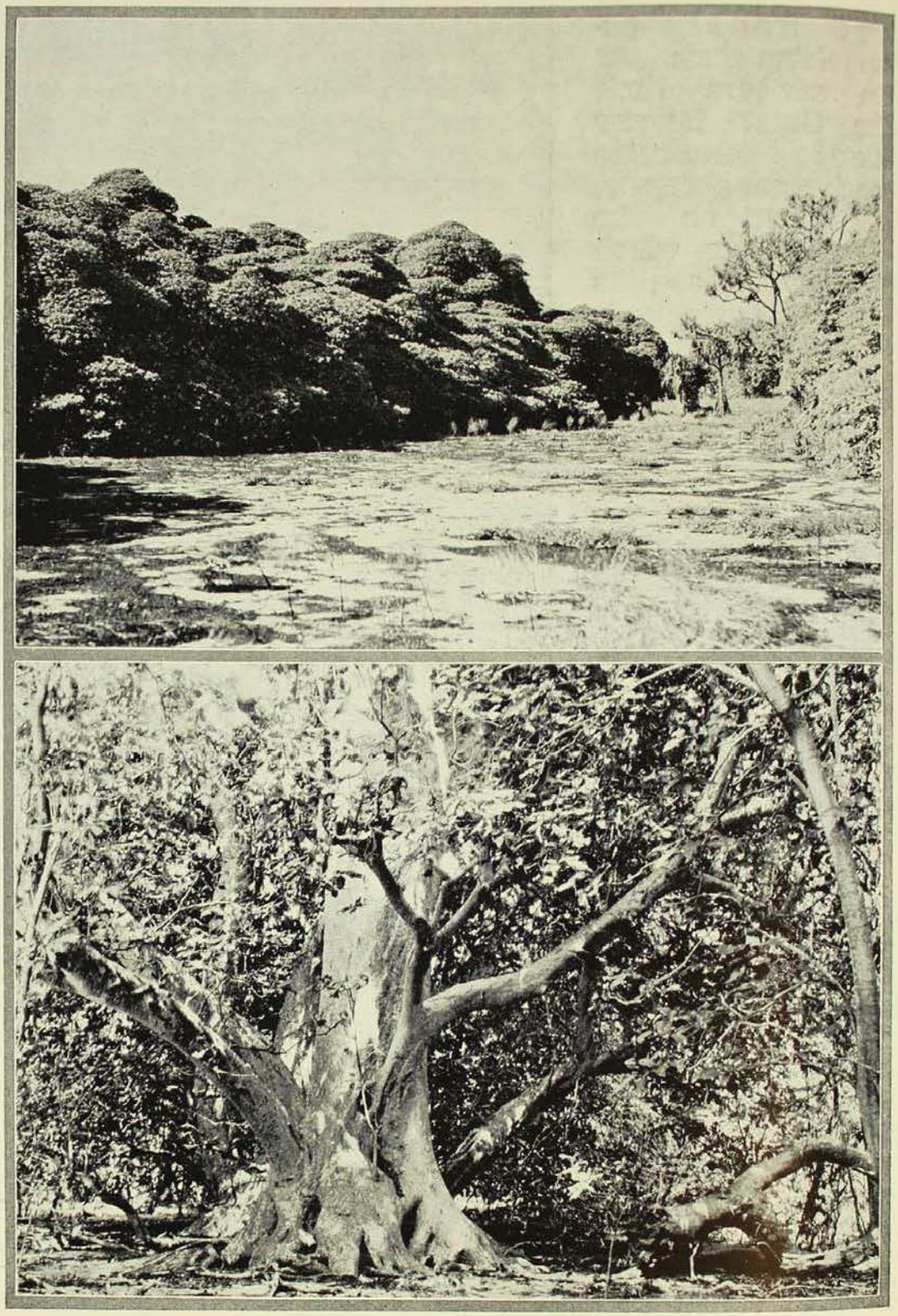
[Photos.—*Embury Brothers.*

The name Great Barrier Reef suggests something in the nature of a single united barrier or wall. Instead, there is in its composition never-ending mazes of individual reefs or reeferies of all sizes and shapes. Actually what is known as the "outer" Great Barrier Reef is an irregular line of narrow banks, each several miles long. Between these are definite breaks or channels of a mile or more. Most are exposed during the very lowest tides, and all but a very few submerged at high water. In their construction the line of outer Barrier reeferies constitutes a huge natural breakwater to baffle the long swells of the open Pacific Ocean. Here a heaving surf is always apparent, even in the calmest weather. Upon meeting the obstacle, each wave thrusts upwards, to fall with a roar and create a smother of foam in its wake. To the eye of a traveller passing in on a boat through one of the breaks there is often an impression of a

seemingly endless line of creaming water. The phenomenon arises from no apparent cause, and is seen to stretch away beyond the limit of the horizons.

CORAL ISLES.

On the landward side of the turbulent outer ribbon of foam are the mazes of reefs already referred to. Many of these are associated with the construction of coral isles termed cays, pseudo or false atolls. In composition the isles are in the main nothing more than heaps of dead coral debris and other lime fragments accumulated at the peak of a reef or coral platform by the action of wind and wave. Some such formations are recent, and barren except for a straggly growth of coarse grass. Others, like the delectable isles of the Capricorn Group, support a luxuriant forest of tropical trees. All, however, form a strong contrast to the islands of rocky construction which occur mostly nearer the mainland, but around which coral growths also cling in the form of fringing reefs. Although the coral isles may be well vegetated, they are always waterless. Because they are always low and flat, they are visible at a distance little greater than the sea's horizon, and appear as grey or dark horizontal lines on the water; at closer range an impression of bushes afloat on rafts is often gained.



Upper: **The billowing foliage of a rich growth of Pisonia trees, which, with the twisted-limbed Tournefortia, the Casuarina and the Pandanus palm, are typical of the verdure of a coral isle or cay.**

[Photo.—*Otho Webb.*

Below: **In the Capricorn Group the Pisonia trees assume massive proportions. Large examples attain a height of eighty feet, and may measure as much as twenty feet around the base.**

[Photo.—*Embury Brothers.*

Some of the coral isles occurring on the inside reefs of the Great Barrier display what some authorities accept as miniature atolls in various stages of development. Among the wonders reported by early explorers of the South Seas was the ever-fascinating tale of the atoll—a coral-formed ring enclosing a body of water. The little Barrier Reef models are good examples demonstrating one of the most recent theories on atoll construction. Initially an area of a submerged growing reef breaks the surface of the water, then the waves gradually pack around it a mass of coral fragments, shell remains, and lime sand. The islet of debris formed in this way assumes a crescent shape, with the outside curve to the windward and the free ends trailing away to leeward. Further drift matter continues to be swept along by the wind and waves, the tails of the crescent lengthen, ultimately joining to form an oval enclosing a lagoon, and in time the lagoon is slowly filled up and the atoll becomes a solid islet or cay.

The south-east trade winds which blow for more than half the year along the coast of Queensland provide the motive power for coral cay construction. It is therefore mostly on the northern quarter of the reef platforms that the coral islets are situated. So strong is the wind's influence that the process of atoll construction described above reaches little further than the stage when its character is evident during the lowest tides. Thus a partially ringed lagoon is already in the process of being filled by wave-driven debris before the coral rampart ring of the atoll has reared above the waves. True atolls in miniature occur in the mid-Pacific region. On the other hand, the atoll of Funafuti in the Ellice Group, and that of the famed Cocos-Keeling Islands, are so immense that their oval lagoons are enclosed by chains of islands; in the last-named the body of water enclosed in this way measures ten miles in length.

The accumulation of coral drift is by no means direct, and Nature's process in the making of coral islets is often a slow and tedious one. While moderate seas may quickly accumulate material in the manner explained, a heavier sea may disperse all or portion of it again. Hence hundreds of years must commonly elapse for even the partial development of such an operation. On one tiny isle known to the writer a whole lighthouse staff is kept busily engaged in building heavy walls of cemented coral rocks in order to prevent the swirling waters removing by erosion the already formed and compact bank of drift.

How have the reefs been formed?

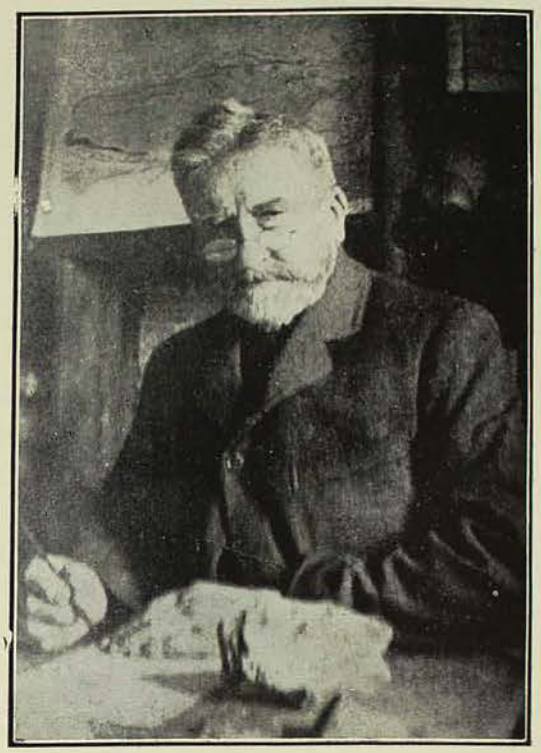
The great question of how the coral reefs have attained their present size and character is still to be decided. It is known that reef-building corals live in depths up to forty fathoms, but no deeper. What, then, of the thickness of the bases upon which the now living growths occur? The twenty to eighty mile wide continental shelf referred to earlier in the article is considered to be the foundation of the reefs of the Great Barrier, which are supposed to have kept pace in growth with a slow subsidence of the shelf during past geological ages. An unsuccessful attempt to prove or disprove this hypothesis was made by an expedition in the late 'nineties on the atoll of Funafuti. At that spot a bore was sunk eleven hundred feet and failed to reach anything in the form of terrestrial or continental rocks. A similar attempt was made as recently as 1921 at the barren cay of large Michaelmas Reef east of the mainland town of Cairns, but the six hundred foot bore produced the same negative evidence as the earlier attempt.

It is obvious that the structure of reefs depends upon their foundations, and that to study these invisible bases is as difficult as the examination of the skeleton within the living body of an animal. The elucidation of the problem must be left in the hands of the geologists. Since, however, the Great Barrier Reef, in common with all coral reefs, is built by animals, its problems are in the main zoological. A later article dealing with this phase will tell of the character, habits, and life history of "The Mighty Polyp" responsible for coral construction.

The Oldest Human Implements and Their Discoverer

BY FREDK. CHAPMAN, A.L.S., F.G.S.

DISCOVERIES in science are frequently associated with the most romantic incidents. One such instance is the finding of the primitive chipped flints on the high plateau country of Kent by the village grocer of Ightham, Benjamin Harrison. The story of this doughty old geologist, as told by his son, Sir Edward Harrison (*Harrison of Ightham,* 1928), is amongst the epics of the science of geology.



Benjamin Harrison.

It was on the 22nd of May, 1865, that Harrison found a "spread" of ochreous gravel on Parsonage Farm near South Ash and brought home two flints with chipped edges. Harrison at first thought that the flints had been naturally chipped from rolling along in the ancient river that eventually dropped its burden of stones. He still went on collecting these rudely chipped flints, as well as those of a later age, referred to as palæoliths and neoliths, from adjacent localities. It was not until 1875, however, after a visit paid to Professor Prestwich at Shoreham in Kent, that, stimulated by his conversation with the Professor, who had lately studied the old palæolithic implements on the Somme, Harrison was convinced that he had here, on the plateau drifts of the Kentish Downs, human implements older even than those of the French deposits on the Somme.

Here there frequently gathered leading men of science.

These roughly chipped, stained, and rolled implements were not accepted as artefacts until 1882, when Professor, afterwards Sir Joseph, Prestwich proposed to bring them before the notice of the British Association meeting in that year. Harrison, however, decided to do more collecting before consenting to their public exhibition. And so it came about that not until 1892, when the

Association met at Edinburgh, was this exhibit of the oldest known flint tools made, and a description submitted to the meeting.

These eoliths or "dawn-stone" tools are now generally accepted as amongst the oldest efforts of early man in Britain, for they must date back to very early Pleistocene or even Pliocene times, to a period somewhere about two million years ago. The gravels containing the eoliths are now found at 400 to 700 feet above sea-level, but before they were lowered to this level by gradual denudation of the chalk, they must have been scattered over a land surface at nearly 2,000 feet above sea-level. The implements are stained from the ochreous clay of the gravels; hence they have been familiarly referred to as "old brownies". According to the Rev. Ashington Bullen, who made numerous discoveries of eoliths in other parts of England, these implements of the North Downs were manufactured when the climate was mild; it afterwards became colder, whilst the gigantic Pliocene Elephant (*Elephas meridionalis*) and the Rhinoceros (*R. leptorhinus*) roamed over the surrounding country.

It is especially interesting to learn how much Benjamin Harrison was indebted to his brother, then in Melbourne, for his taste for geological work. The present writer frequently met Harrison when he came to London, and, after joining the staff of the Melbourne National Museum, received a letter from him as follows:

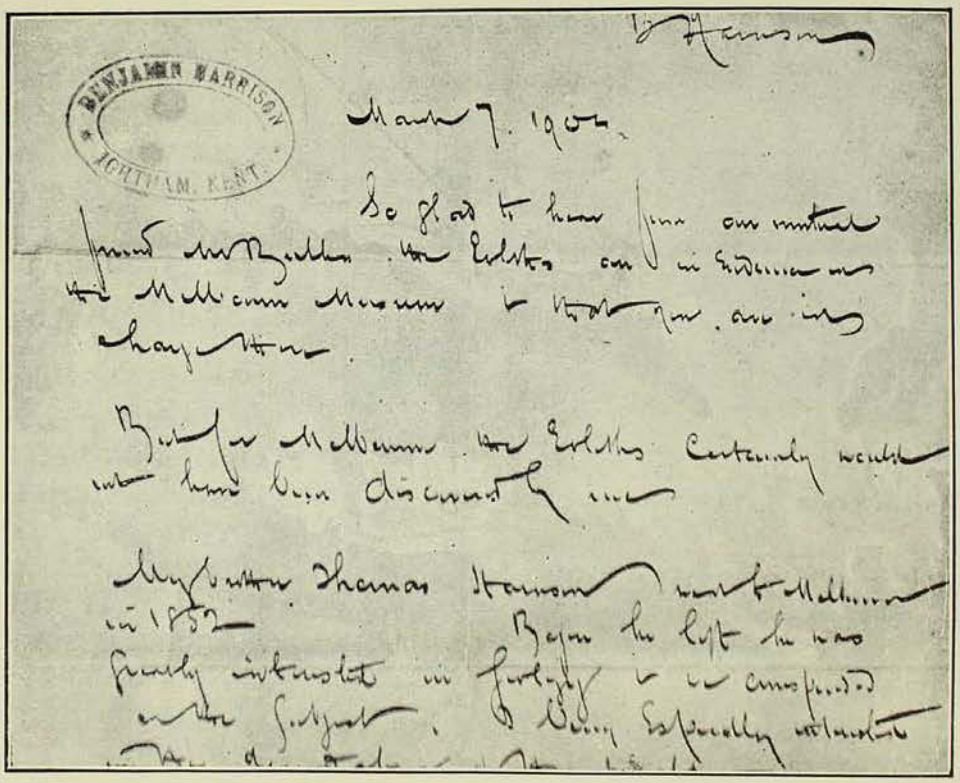
March 7, 1902.

So glad to hear from our mutual friend Mr. Bullen the eoliths are in evidence in the Melbourne Museum. . . . But for Melbourne the Eoliths certainly would not have been discovered by me. My brother Thomas Harrison went to Melbourne in 1852. Before he left he was greatly interested in Geology and we corresponded on the subject, I being especially interested in the denudation of the Weald.

In a few years he got an appointment in the Patent Department, Registrar General's Office, and was a great friend of Julian Tenison Woods and also Prof. McCoy.

This led to his wishing me to send all the Secondary fossils I could get, and for many years, 1862 to 1866, I was continually on the search.

I sent my boxes of fossils to my brother so that some came from the very field in which the spread (that is of implement-bearing gravel)



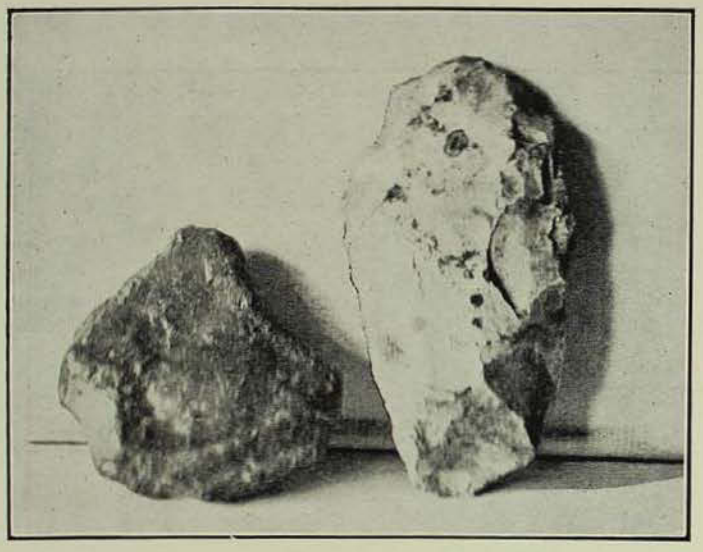
Harrison's letter to the author, referred to on this page.

is. He was one of the founders of the Melbourne Geological Society and his name appears in the Transactions and also in the Royal Society, of which he was a Fellow.

It still remains to find, in some obscure collection in Australia, presumably that of Tenison Woods, the original eolith and palæolith that Benjamin Harrison sent to his brother Thomas in 1854-5. That Thomas Harrison took a keen interest in geology is also evident from the fact that he found a new species of trilobite, *Homalonotus harrisoni*, named after him by Sir Frederick McCoy, and which is now in the Melbourne National Museum.

Before 1902 the British Museum authorities did not include the eoliths in their collection of human implements. Since that date, however, the *Guide to the Antiquities of the Stone Age* included them, and a still later *Guide to the Fossil Remains of Man* assigned them to the Pliocene.

Among Australian ethnologists these eoliths should excite the greater interest since they resemble, in some respects, the Tasmanian types of tool, which are of a



Eolith from Ash, Kent, and palæolith from Portslade, Sussex.

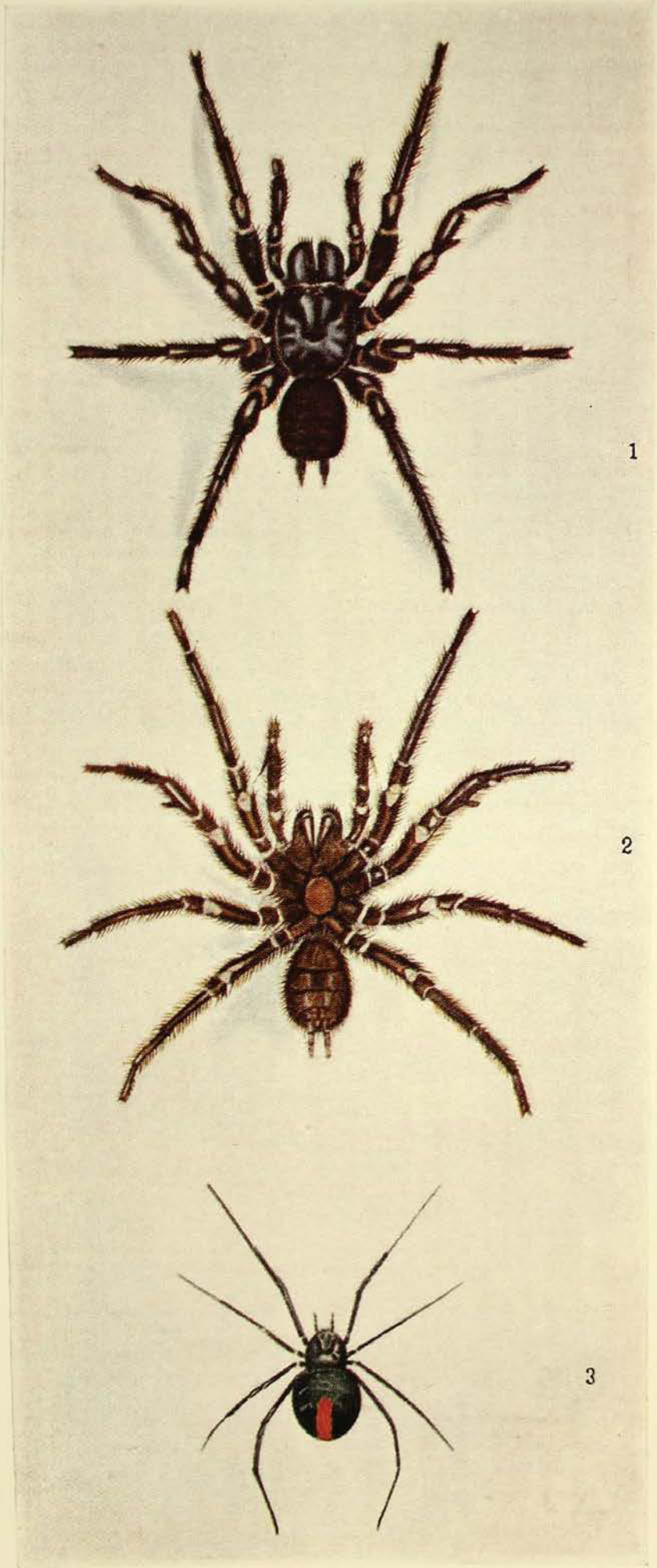
much more primitive and rougher kind than the sleekers and drills of the present-day aborigines of the Australian mainland.

It was a privilege to know this fine old naturalist, who, undeterred by the scepticism of his fellow geologists, at last was able to prove as fact what his instinct and insight had prompted him to feel was true. He was a keen naturalist, as may be seen in the letters collected by his son, where he descants on plants, animals, or stones alike; whilst his frequent references to the beautifully sculptured scenery of Kent in all its seasonal aspects showed that he had the artistic sense strongly developed. His journeys over the Kentish plateaus with Prestwich, although in the main devoted to geology, were full of minor incidents. In his son's words: "Here was a striking natural feature which Harrison felt bound to point out, there was a dene hole, a sarsen or other object of interest. Sometimes a detour was made to secure a favourite Chalk flower, often a gap in hedge or wood commanded one of those wonderful views over the Weald that cannot be passed without admiration."

What a galaxy, indeed, of remarkable men of science did this little Kentish village of Ightham attract, through the discovery of the eoliths, and amongst Harrison's letters are pen-pictures of such famous men as Rupert Jones, Joseph Prestwich, Ray Lankester, and John Evans. There they would discuss with Harrison various knotty points concerning the old rude water-transported tools and how they came to be mixed up with the better finished tools made by the palæolithic men of later age.

Harrison lived to see his belief in the eoliths as artefacts confirmed, for he had always contended that they could be sorted into distinct types, according to their shapes, and that this could only be possible if they had been intentionally chipped. Some of those in the writer's collection sent by Harrison show the bulb of percussion, the hall-mark of a true artefact.

Benjamin Harrison, who died at the good age of 84, was to the last alert and keen in his favourite study. He was the type of man whose aim could be said to be indicated in a quotation from his own note-book: "He that would accomplish anything in his short life must apply himself to the work with such concentration of his forces as, to idle spectators who live only to amuse themselves, looks like insanity."



1

FIGURE I.
Atrax robustus, male, dorsal aspec
(Natural size.)

2

FIGURE II.
Atrax robustus, male, ventral aspect.
(Natural size.) Shows biting fangs

3

FIGURE III.
Latrodectus hasseltii, female.
(Natural size.)

From *The Medical Journal of Australia.*

[Ethel A. King, *del.*

The Poisonous Spiders of Australia

By Dr. W. Wilson Ingram and A. Musgrave, F.R.E.S.

FOR nearly a century attention has been drawn by careful observers to the effects of the bites of poisonous spiders. Cases have been described in southern European countries, America, Africa, Australia and New Zealand; in all these countries from time to time fatal cases have been described, but there has been at times some doubt whether the spider was the cause of death, and that doubt has arisen in cases where a considerable interval has elapsed between the time of the bite and the death of the individual.

As we will point out later, the difference has been that some species of poisonous spiders, particularly the Red-spot Spider, *Latrodectus hasseltii,* has as its normal habitat outdoor privies and other unsavoury localities, and its bite, apart from inoculating its own toxin, may introduce at the same time very virulent organisms which, giving rise to septicæmia, cause the death of the individual indirectly. That does not rule out the fact that these deaths have been due to the bite of the spider. In Australia, in addition to *Latrodectus hasseltii,* there are other poisonous species living in holes in the ground, under logs, in stumps, under houses, which cause the death of the individual directly by venom injected at the time of biting. In these cases an interval of a few hours only has elapsed between the bite and the death of the individual. These spiders are much larger than *Latrodectus hasseltii,* therefore inject a much larger amount of venom, and in addition the venom can be regarded as much more deadly than that of the Red-spot spider.

Spider poisoning, or arachnidism, has been studied exhaustively in the United States of America by Dr. E. Bogen, of the Los Angeles General Hospital, and he has pointed out that there is a succession of symptoms which follow on the bite of the American poisonous species, the Black Widow, *Latrodectus mactans.* In the United States there is only one poisonous spider, and it corresponds to our Red-spot. Dr. Bogen's experience has been the same as that of observers in Australia, namely, that the bite of the Red-spot spider may cause very serious illness in some individuals and little or none in others, but that there is an added grave risk of septic complications.

In Australia cases of spider bite poisoning, with several fatalities, have been reported from 1863 to the present day, and undoubtedly numerous cases in which recovery has taken place and which have never been reported have occurred throughout the country. An analysis by the Government Statistician of New South Wales of the deaths from venomous bites from 1927 to December, 1932, reveals the fact that during that period deaths from snake bite totalled ten, whereas deaths from spider bite totalled seven. There was an additional death from spider bite in Sydney in January, 1933. These figures are startling enough, but become more so when it is realized that the most lethal of the spiders, the "funnel-web", *Atrax robustus,* is, as far as we know, confined to a small area of the State.

Three spiders are definitely regarded as harmful to man in Australia, namely, *Atrax robustus, Atrax formidabilis* and *Latrodectus hasseltii.*

The spiders of the genus *Atrax* are included in the sub-order Mygalomorphæ of the order Araneida. The members of this sub-order are characterized by the four lung slits situated on four light reddish areas at the base of the under surface of the abdomen, and leading to the lung books, and by the cheliceræ or poison fangs being placed side by side and so articulated that they move up and down.

The spiders of the genus *Latrodectus*, on the other hand, are included in the remaining sub-order of Araneida found in Australia, the Arachnomorphæ. This group includes all the true spiders, and in these, with few exceptions, two lung slits are present in the epigastric furrow towards the base of the abdomen, while tracheæ, as well as lung books, are present. The cheliceræ or poison fangs are jointed to move in a pincer-like manner from side to side.

THE SYDNEY FUNNEL-WEB SPIDER, ATRAX ROBUSTUS.

The genus *Atrax* includes eight species of spiders occurring in eastern Australia and Tasmania, but toxic bites have been recorded from two only of them, namely, *Atrax robustus* and *Atrax formidabilis*.

Atrax robustus is a large black or reddish-brown spider, the male measuring about 24 millimetres (or one inch) in length and the female about 32 millimetres (or one and a third inches). The cephalothorax is black, shining, and smooth, the abdomen dull brown, while ventrally the body is reddish-brown. The male has relatively longer legs than the female and is rather more active. Both sexes are very pugnacious and attack on the slightest provocation. In all those cases of bites in which the spider has been captured, examination has proved it to be of the male sex, though one female has been captured at Pennant Hills in July of this year which bit a woman residing there. She was treated at once and suffered no serious symptoms. In view of the fact that the female is just as aggressive as the male and, moreover, in captivity will attack males placed in the same jar, it is difficult to ascribe a reason for the absence of "bites" from females. With the exception of the case at Carlingford, that of a little girl aged five, and that of a young woman, the spiders responsible for the poisoning have been captured and sent to the Australian Museum for identification.

Atrax robustus is a member of the family Dipluridæ, the members of which do not construct lids to their burrows or retreats, but spin, instead, a funnel of silk. The term "trap-door" spider, under which it has appeared in medical literature and in the press, is erroneous, for, though it is closely related to the true trap-door spiders, none of these lid-building forms have yet been recorded as harmful to man. *Atrax robustus* seems to take advantage of any natural crevice in which to place its silken tube, such as by the side of fence posts, under logs, stones, and in rotten tree stumps. At the entrance of its retreat the silken strands are stretched out to form a funnel. The vast majority of the specimens of this spider sent to the Australian Museum have come from the northern shores of Port Jackson. They have been found not only in gardens and the bush, but also inside houses, where some of the occupants have received bites.

EFFECTS OF BITE.

From 1927 a number of cases of spider bite due to *Atrax robustus* occurred, with four deaths and sundry recoveries. Those who recovered were at first desperately ill, and a detailed account of one of these cases is given in our paper in *The Medical Journal of Australia*.[1] Of the patients who died, one was a baby boy, while the others were females, aged five, twenty-five and forty-seven years. The younger woman died in January of this year. The two children died within two hours of being bitten, while the two women died within 11-13 hours.

THE NORTH COAST FUNNEL-WEB SPIDER, ATRAX FORMIDABILIS.

Atrax formidabilis is a larger species than the preceding, and is known only from males. In appearance these resemble the males of *Atrax robustus*, but are easily determined by the rounded spurs of the tibiæ of the second pair of legs, those of *Atrax robustus* being pointed. The type was recorded from the Richmond River, and only a few specimens have since been secured. One of these was responsible for a case of poisoning at Wauchope, North

[1] Dr. W. W. Ingram and A. Musgrave: Spider Bite (Arachnidism): A Survey of its Occurrence in Australia, with Case Histories. *Medical Journal of Australia*, II, 20th year, 1933, pp. 10-15, col. pl. and fig.

Coast, New South Wales, and was referred to in an article in the Australian Museum Magazine, Vol. iii, No. 4, 1927.

THE RED-BACK SPIDER, LATRODECTUS HASSELTII.

The "red-back", "red-spot", or "jockey spider", is a member of a genus distributed throughout the tropical and subtropical regions of the world. The Californian species, *Latrodectus mactans*, known popularly as the "black widow" or "hour glass" spider, has formed the subject of interesting papers by Bogen, and Bogen and Berman, and has habits similar to those of *Latrodectus hasseltii*.

Latrodectus hasseltii attains a length of about half an inch, or 12·5 millimetres, the abdomen being about the size of a pea. The colour of the body is black with a red stripe situated towards the centre of the upper part of the abdomen and tapering posteriorly. In front of this again may be smaller orange or red lateral markings. These markings tend to vary, being perhaps more pronounced in the smaller examples. The legs measure about five centimetres (or two inches) in length. The species is widely distributed throughout Australia, and ranges from Eastern Arabia through Indo-Malaya to the Pacific Islands and New Zealand.

The spider builds its web in dark corners, in empty tins, watering cans, flower pots, or among loose rubbish; it occurs also under stones and rock shelters, while a favourite haunt is under the seats of closets in country districts where the dry earth closet is in vogue.

EFFECTS OF BITE.

In the medical literature of Australia there are references to ninety-eight cases, although only fifty-six of these are described. Some of the writers also state that each year they see in their practice a number of cases, so that it is impossible to estimate the number of actual bites from the "red-back" spider in Australia.

An analysis of the actual recorded sites shows that:

64% were bitten on the buttocks and neighbouring parts.
8% were bitten on the hand.
8% were bitten on the arm.
5% were bitten on the foot.
5% were bitten on the leg.
5% were bitten on the thigh.
5% were bitten on the head.

The majority were bitten while using outdoor closets, across the seats of which the spiders had spun their webs. Among the ninety-eight cases recorded there are records of six deaths, and an additional death is referred to as having been due to gas gangrene (malignant œdema) following the bite.

An analysis of the deaths reveals the information that in some cases a considerable period elapsed before death. In one case the bacillus of gas gangrene was recovered from the local lesion, and when death had occurred late it was probably due to secondary infection.

The deaths recorded in Australia from the "red-back" spider are set out in the following table:

Deaths from "Red-Back" Spider in Australia.

Sex.	Age.	Time Elapsing before Death.
Male	3 months	6 hours
Male	3 years	36 hours
Male	17 years	3 days
Male	Adult	7 days
Male	Adult	14 days
Female	Adult	30 days

There is an additional death classified as malignant œdema following spider bite. This makes seven deaths, but the mortality rate cannot be estimated, as so many of the cases are not recorded, but presumably it is not high. The cases vary in severity, due perhaps to individual susceptibility or the condition of the spider. In cases of septicæmia following the bite of the "red-back" spider the bite may be overlooked in the more serious septic complications. Bogen quotes cases confirmed by *post mortem* and bacteriological examination of tetanus, erysipelas, cellulitis, and septicæmia, following the bite of the "black widow" spider, whose habits are similar to those of the "red-back" of Aus-

tralia. The liability to septic infection following "red-back" spider bite must always be borne in mind when instituting treatment for the condition.

NATURE OF SPIDER VENOM.

There has been a good deal of controversy regarding the toxicity of spider venom. In the hands of some workers the harmful effects of spider bites on animals, as claimed by others, have not been confirmed. Isolated cases have also been reported of toxic bites from species regarded as harmless. These cases may have occurred in very susceptible individuals. Although some observers have stated that the bite of *Latrodectus* is harmless, the experience of a large number of clinicians, and the experimental evidence produced by Kobert, Sachs, and Kellaway, leave no doubt about the poisonous properties of the spider venom.

It is now agreed that the chief constituent of the venom is a neurotoxin, but a hæmolysin substance destructive to red blood corpuscles has also been described. Castellani and Chalmers also state that it contains a substance which increases the coagulability of the blood. It is doubtful whether this is so, and the undoubted increased coagulability can be attributed to the extreme dehydration which occurs.

Experiments on the venom of the Australian "red-back" spider have been carried out by Dr. C. H. Kellaway. He found it extremely toxic to laboratory animals. The action of extracts of the head and the body of *Latrodectus hasseltii* acted differently. Extracts of the heads, like unadulterated venom, caused death in the guinea-pig from bronchial constriction. Those of the bodies appeared to act on the heart, causing rapid failure. Observations on the clotting times of animals dying, following the bite of the spider, did not support the view that the venom has any effect at all on the coagulation of the blood. Extracts of the head do not cause destruction of the red blood corpuscles with liberation of hæmoglobin, while extracts of the bodies, as is the case with other spiders of this genus, were found to have this destructive effect.

This confirms the work of Kobert and Sachs.

No work has yet been published on the venom of *Atrax robustus*.

GENERAL COMMENTARY.

The effects of the venom of the two poisonous Australian spiders are similar in many respects. There is rarely any local œdema, and then only probably with septic bites from the "red-back". The neurotoxic action with collapse is much greater in poisoning by the "funnel-web", all the persons bitten by this spider having been desperately ill.

Except at the time of the actual bite, pain was never complained of by the "funnel-web" victims, while it occurred without exception in those bitten by the "red-back", and was in nearly every case described as very severe and resistant to sedatives. Thereafter the symptoms were common to both species.

It is extremely fortunate that *Atrax robustus* is confined to a small area of the State, and that it appears only at night, when the chances of human contact are remote. It has been found mostly in an area where the population has begun recently to spread rapidly, and must be guarded against. There is need for investigation of its venom and general habits.

TREATMENT.

Where the bite has occurred on the extremities the immediate treatment must be the same as for snake bite. A tourniquet must be put on, the site of the bite incised, and potassium permanganate applied. A doctor should be called at once. The tourniquet should be left on till the doctor arrives. If a doctor is not immediately available, fractional doses of the venom should be admitted to the circulation until immunity is acquired. If signs of collapse appear, the tourniquet should be reapplied and the patient treated for collapse. Often, however, especially with bites from the "red-back"

spider, it is impossible to apply a tourniquet or scarify the wound. The bite of *Latrodectus* may not hurt much at first, and it is only after an interval, varying from a few minutes to ten hours, but in the average two hours, that symptoms appear. The victim may not remember until after his illness that he felt a sting. In these cases it is too late to deal with the local lesion, except to try to combat the development of septic complications. Ichthyol or iodine applied locally will best serve this purpose. In consequence of the constant vomiting and profuse perspiration which occur, the patient becomes extremely dehydrated. This causes great embarrassment to the heart, resulting in insufficient aeration of the blood (cyanosis), and if not combated will greatly accentuate the tendency to heart failure. The treatment for this condition has been discussed in the article in the *Medical Journal of Australia*. Every case, especially of poisoning by *Atrax*, requires constant attention, and symptoms will have to be treated as they appear.

[We wish to acknowledge our thanks to *The Medical Journal of Australia* for the beautiful coloured plate by Miss E. A. King which accompanies this article.]

The Magic Voice: A Story of the Australian Lyre-Bird. By R. T. Littlejohns. (Ramsay Publishing Pty., Ltd., Melbourne). 1933. 4to, pp. 40, plates 15. Price: 5s. Our copy from Robertson and Mullens, Limited.

The Lyre-bird is one of the most intriguing of the birds of Australia. On account of its aberrant structure, it stands apart, its actual relationship to other birds being still a matter of conjecture, while its secretive ways, its unorthodox choice of midwinter as breeding season, its habits of display and its marvellous ability as a songster and mimic, combine to heighten the interest in this remarkable bird.

Much has been written regarding its habits and vocal powers, and the author of this attractive work is not the least enthusiastic and successful of those who have endeavoured to make these known. Mr. Littlejohns is justly celebrated as an ornithologist and nature photographer, his reputation having been established by his *Birds of Our Bush*, written in conjunction with Mr. S. A. Lawrence, and many other notable contributions on the subject. As might be expected, this new work is a charming and well written account of the home life, the display, and the song of the Lyre-bird. The author is to be congratulated on the success of the photographs reproduced in the book, for, on account of the shyness of the subject and the indifferent light in the gloomy forest aisles, where alone such photographs can be obtained, it is exceedingly difficult to secure good negatives. The excellent photographs of the male in full display should convince everyone that the orthodox illustration of the bird, with the tail showing the lyre shape, is quite erroneous.

Mr. Littlejohns gives an interesting account of the Lyre-birds of Sherbrooke Forest, an area of about three square miles, twenty-five miles from Melbourne, where Lyre-birds are to be found in relatively great numbers, and where the recording and broadcasting of the Lyre-bird's song were carried out.

The author has supplied a time-table for use with the gramophone record, a running description of the song, and a list of the birds whose songs are imitated by the Lyre-bird.

C.A.

Frogs and Toads

BY J. R. KINGHORN, C.M.Z.S.

GENERALLY speaking, the names toad and frog are used indiscriminately, many people describing a frog as a creature with smooth skin and webbed toes, and a toad as having a warty skin and toes without webs. Such descriptions can be very misleading, as there are many examples of amphibians which are intermediate in these characters, and they would be most difficult to classify were it not that a frog always has teeth along the upper jaw bone, while toads have none. The toad family is very poorly represented in Australia, the majority of our amphibians being frogs.

DEVELOPMENT.

With some exceptions, the eggs of frogs and toads are laid in or near water; in the latter case, the eggs or tadpoles are washed into more or less permanent water after rain. The freshly laid eggs of some of our toadlets resemble tapioca, and may be found in long damp grass or under debris in the garden, but the eggs of frogs may be detected as frothy masses among reeds or weeds on the surface of some water-hole.

On hatching, the long-tailed larvæ or tadpoles have external branching gills, which soon give way to internal ones, and later the tadpole becomes a breather of air, gulping at the surface of the water and swallowing the air. Under favourable conditions, the hind legs appear after a few days, the front ones soon follow, and the tail gradually disappears. Many boys keep tadpoles in tins and bottles for days, hoping to see the tail drop off, but none of them have yet observed this, as it does not happen. The disappearance of the tail is part of a well laid plan of nature. The young tadpole has a sucker mouth, and during the period of the change from the sucker to the true frog mouth, the little fellow cannot eat, and so the tail is gradually absorbed, thereby acting as as a reserve food supply. After this change we find a small but true frog or toad, which hops out on to the land, there to lead a more or less terrestrial life as its habits may demand.

Among the exceptions to these general breeding habits, one might mention the Surinam Toad as outstanding. This toad

A tree frog, Hyla ewingii, commonly found under loose bark clinging to the trunks of trees.

[Photo.—*K. C. McKeown.*

lives in very dry areas, and, as the breeding season approaches, the skin on the back of the female becomes thick and jelly-like. As the eggs are laid, they are pressed into this jelly mass by the male, and soon each egg is in a perfect closed capsule. In this capsule or cell the eggs develop, the young undergo a tadpole stage and emerge as complete little toads.

VOICE.

Frogs and toads are interesting because the majority of them possess a voice of one sort or another, and they present the

best examples of voices to be found among cold-blooded creatures. The voices are very varied, and in some frogs the vocal sac, when fully inflated, is almost as large as the frog itself. This is so with the European Tree Frog, and to a lesser degree with the Australian Golden-sided Frog. The croaking of these frogs is exceptionally loud, and when in unison can be heard more than two miles away.

The remarkable Barking Frogs, or Horned Toads of Brazil, which grow to about eight inches in length, emit cries which resemble the wailings of human beings, while these sounds are varied with distinct barks and bell-like notes.

BREATHING.

Not possessing articulated ribs which can be raised and so fill the lungs with air, the mechanism of breathing in frogs and toads is very different from that of other animals. They have highly elastic lungs, which are filled or emptied by the agency of special muscles situated in the floor of the mouth. Air is drawn into the closed mouth through the nostrils and forced into the lungs and out again by these muscles, and it is during this action of breathing or swallowing air that we note the pulsations of the throat.

SOME AUSTRALIAN FROGS.

The most widely distributed and best known of all our frogs is the Golden-sided or Green Swamp Frog, *Hyla aurea*. Though belonging to the group of tree frogs, it leads an aquatic life, and is often found sitting on the bank of a water-hole, or clinging to a reed. It cannot live longer than about twelve hours if kept in a dry place, such as the room of a house, as its skin quickly dries, eventually causing its death.

The largest of the Australian frogs is the northern Green Tree Frog, a species which resembles the commoner *Hyla cærula* of eastern Australia. All tree frogs have large disks on the fingers and toes, which are useful when climbing smooth surfaces. Some species, such as the green ones, live in drain pipes, crevices in retaining walls, and similar places, and they are useful in the garden because of the number of beetles, "slaters", and other pests which they devour. The smaller tree frogs, such as the grey or brown *Hyla ewingii* and its subspecies, prefer to hide away under the loose bark of trees; *Hyla ewingii* is very common along the Murrumbidgee and other inland rivers.

A large burrowing frog, Limnodynastes dorsalis interioris, of the inland areas of southern New South Wales.

[Photo.—*K. C. McKeown.*

The bulkiest of the Australian frogs is *Limnodynastes dorsalis*, referred to in some places as the Bull Frog, and an inhabitant of the inland areas. It is often mistaken for a toad, as it has a warty skin and no webs between its toes; also it is a land lover, but, as it has teeth in its upper jaw, besides other special characters, it is a true frog.

During the summer months it takes to the water and burrows in the banks of streams, dams, and swamps, but during the winter time it hibernates in drier places by burrowing into the soft

earth of gardens and fields. At Yanco last year a party from the Museum dug up several specimens during the month of October.

WATER-HOLDING FROG.

The most interesting of our frogs is a somewhat shapeless little fellow that lives in the clay pans of Central Australia. In this area, which is subject to long dry spells, with occasional copious rain, usually of short duration, it is necessary for the frogs to adapt themselves to the surroundings, so as to attain the adult form without having to undergo a tadpole stage in water, or else to adopt some habit that will tide them over until a rainy season. The latter is the case with the Water-holding Frog, *Phractops platycephalus*. It burrows into the bed of the drying up clay pan, taking into its body a large supply of water, sufficient to keep it alive until the next rain. During the period of waiting the frog is hibernating some eighteen inches below the surface, the water keeping it and its cell moist. When the rain arrives and the bed of the clay pan is thoroughly soaked, the frogs come to the surface and lose no time in laying their eggs. The tadpoles hurry through their metamorphosis in time to take advantage of the abundant insect food supply that usually follows good rains and herbage.

TOADLETS.

The most widely distributed and best known members of the toad family in Australia are the little toadlets belonging to the genus *Pseudophryne*. These tiny creatures, measuring about an inch in length, have fat bodies, small sharp-pointed heads, and short limbs and toes. The under-surfaces are boldly marked with grey and white marblings, while the upper surface is brownish, with a yellow or red triangle on the head and conspicuous marks on the upper arm and thigh. During the day *Pseudophryne* hides away under stones, leaves, or long grass where it is damp, and comes out at night to hunt for small insects. It is not a swimmer, and does not resort to water even for breeding purposes. The eggs are laid during or after rain in depressions or rock cavities, or under stones in damp places, and they sometimes remain for months until washed by further rain into a suitable place for the tadpole to hatch and undergo a somewhat rapid metamorphosis to reach the adult stage.

Conrad Wolffhart in his book "Prodigiorum ac Ostentorum Chronicon", published at Basel in 1557, depicted "rain mixed with frogs" that fell in Germany in 1345.

RAINS OF FROGS.

Many people still believe that frogs and toads are occasionally brought down by a shower of rain, having been carried up into the air by a waterspout or a willy-willy which had passed over a water-hole, and later showered down during a thunderstorm; but as we never hear of a shower of tadpoles, not much faith can be placed in that belief. One writer suggested to me that frogs' eggs were carried up, and that they developed in the clouds, but he forgot to make provision for the retention of eggs or tadpoles in the atmosphere on a cloudless day. People who make statements regarding showers of frogs have never seen them falling; therefore the following solution of the mystery should enlighten them. During dry weather, frogs and toads take refuge in the deep cracks that open in dried up water-holes and similar places, and during or immediately follow-

ing a shower of rain they come to the surface. As their appearance is simultaneous with the coming of rain, many people jump to the conclusion that there was a "shower of frogs".

FROGS IN STONE.

Another common belief is that frogs or toads are occasionally found in a pocket in solid stone or wood where there was no indication of way of entry. The fact is that either the egg, tadpole, or very young frog, had been washed into a crevice, then down through a crack into a pocket; the entrance filled up and the imprisoned frog grew to completely fill the pocket. In such a place a frog might remain for years, provided air and moisture reached it. A British scientist proved that toads could live a very long time in a state of hibernation, provided air and moisture reached them, and in proving this he prepared two blocks of stone, one limestone, one sandstone; in each of these he bored three holes and into each hole he placed a toad, cementing a glass lid over the top. The stones were buried three feet in the earth, and left there for over eighteen months. On being dug up, the toads in the limestone were found to be dead, limestone being impervious to air, but those in the sandstone were alive, both air and moisture being able to penetrate the rock in which they were held captive.

THE BROOKS OF MORNING: NATURE AND REFLECTIVE ESSAYS. By Donald Macdonald. (Angus & Robertson, Ltd., Sydney.) 1933. 8vo., pp. xii + 245. Price: 6s.

The late Donald Macdonald, who died November 23, 1932, was recognized as one of our foremost writers on nature subjects, his work being characterized by sound knowledge, delicate fancy, and a fine literary style. The present work is a reprint of articles which have appeared in the *Argus* during the last thirty years, the selection being made by his daughter, Mrs. Elaine Whittle. The four-four essays cover a wide range of subjects, from "The Relief of Ladysmith" to "Nobody's Dog", from "An English Hedgerow" to "Everglades of the Murray", for Donald Macdonald enjoyed a full life and had the gift, vouchsafed to few, of being able to invest with interest and even glamour what to most people would be but commonplace. Turn to "A Tragedy of the Cafés" and you will find a serio-comic lament that the old-style floury potato has been so improved by the cultivator that it is "of no use whatever for mash, but incomparable for mucilage". "At Low Tide" is a delightful description of the seashore and its inhabitants, and conveys an atmosphere of light heartedness and boyish enjoyment, which indeed pervades the book with tonic effect. This joyous spirit was characteristic of the author, who, though confined to his room by illness for some years before his death, retained his cheerful outlook and still delighted in watching from his window the birds disporting in their bath and amusing themselves in bird fashion. His last article appeared in the *Argus* but four days before his death.

Mr. E. S. Cunningham, his colleague on the *Argus* staff, writes an appreciative foreword to this delightful book, which is a fitting memorial to a gifted and heroic soul.

C.A.

Some Household Insect Pests*

PART II

BY ANTHONY MUSGRAVE, F.R.E.S.

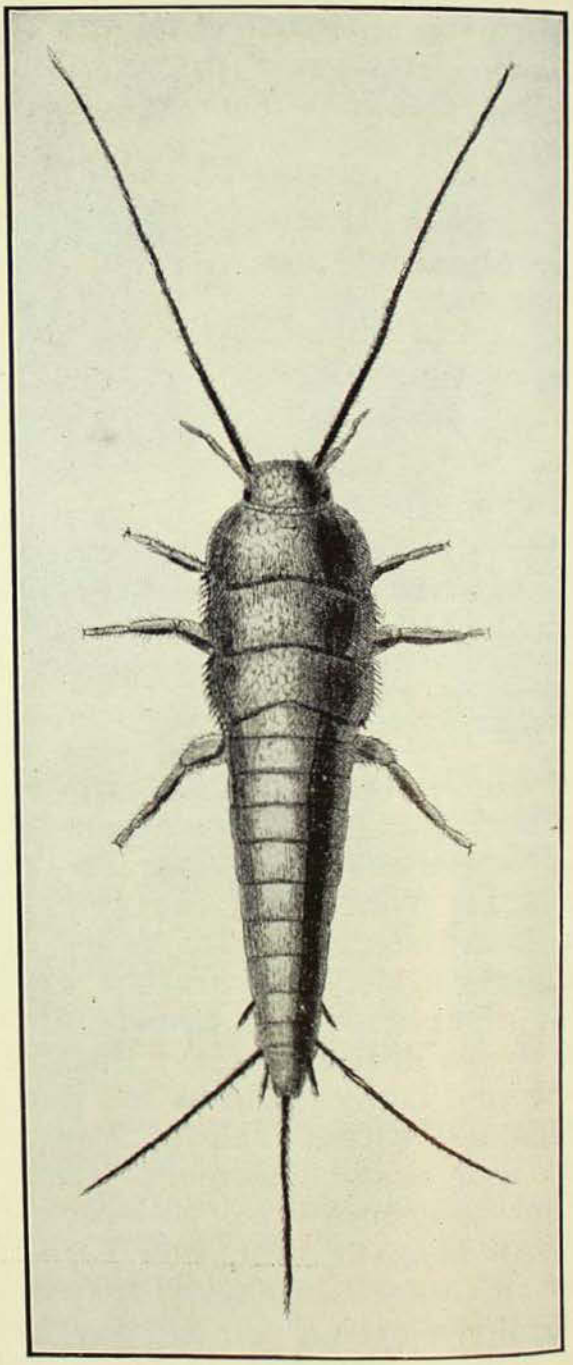
INSECTS WHICH AFFECT CLOTHING AND FURNITURE

Silver-fish and Booklice.

The principal enemies of books and printed matter are Booklice (*Psocidæ*) and Silver-fish (*Lepisma*). The former are very delicate tiny creatures which occur commonly in botanical or entomological collections where proper care has not been taken to preserve them against infestation. They also damage books, wallpapers, pictures, and feed on organic matter such as feathers, hair and furs. They are attracted to farinaceous food such as flour and breadcrumbs, and also to the starch in book-bindings.

Silver-fish do great damage in libraries in Australia by destroying the bindings of books and eating the paste on book labels. It has also been recorded as eating starched clothing and artificial silks (rayons). The paste on the back of wallpaper is very attractive to silver-fish and sometimes the paper becomes riddled and peels off. Dampness attracts them and they may often be captured in a bath or hand-basin.

The life-history of the common European Silver-fish (*Lepisma saccharina*) is given by E. A. Back[1] in a comprehensive paper on this insect. The female lays her eggs in the crevices in which it hides. In tropical climates these may hatch in from six to ten days, or in milder temperatures of 64° to 68° F. they may not hatch for



The European Silver Fish, Lepisma saccharina.

[*After* Lubbock.

* Part I, dealing with insects which annoy or carry disease, appeared in the previous issue of this MAGAZINE, Vol. V, No. 3, July-September, 1933, p. 97.

[1] E. A. Back, The Silverfish as a Pest of the Household, *U.S. Dept. Agric., Farmer's Bull.*, No. 1665, 1931, pp. 1-5, illustr.

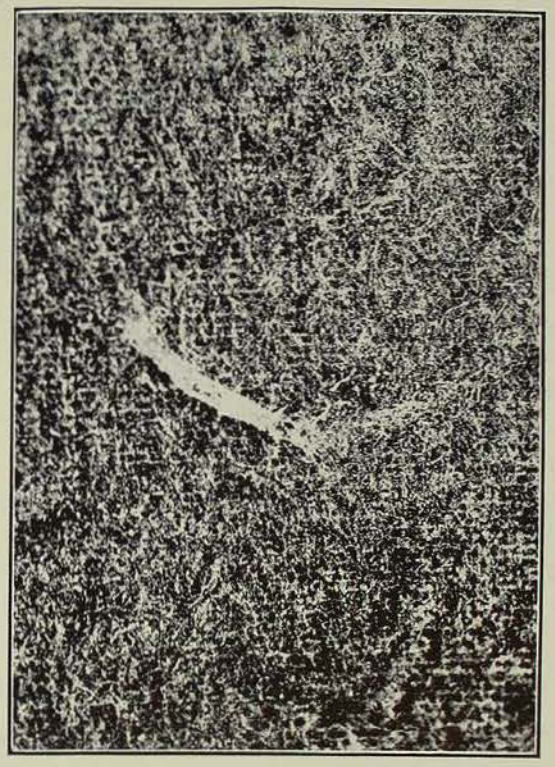
forty-six to sixty days. The young, on emerging from the eggs, resemble the parents, and progress by a series of moults until the adult condition is attained. This may take from seven to nine months in tropical climates, or about two years under temperate conditions. Adults are recorded as living without food for 319 days, and 327 days with access to food.

According to Dr. R. J. Tillyard[2] "the common introduced silver-fish in Australian houses is *Ctenolepisma longicaudata* Esch., originally described from South Africa."

Control.—The starchy nature of their food renders them easy to control by means of poisoned mixtures. One mixture consists of twelve parts of sodium fluoride to a hundred parts of flour. Another poison bait is prepared by mixing one-half to three-quarters of an ounce of white arsenic (or Paris Green) with one pint of flour and adding enough water to make into a thin paste when boiled. The paste is poured on to thin cardboard or paper, which may be rolled into cylinders with the paste on the inside. The powder or the cylinders are placed on bookshelves, among papers, in drawers and cupboards where the insects congregate. Care should be taken to see that children do not touch the cylinders or the powder. Pyrethrum power may be blown about where the silver-fish live. A spray consisting of a saturated solution of paradichlorobenzene in carbon tetrachloride may be sprayed about a room where the silver-fish lurk.

Clothes-moths.

Two species of clothes-moths are injurious to clothing, piano felts, rugs, upholstered furniture and woollen goods in homes about Sydney, the Webbing Clothes-moth (*Tineola biselliella*) and the Case-making Clothes-moth (*Tinea pellionella*), both of which have been introduced into Australia through the agency of commerce. The adults of the two species are similar in appearance, differing but slightly in colour, the case-making species being greyish-yellow with dark spots on the forewings, while the webbing form is uniformly straw or buff coloured. Of these the webbing form is the greater pest in the vicinity of Sydney. The larvæ of this species construct flimsy, white, silken, feeding tubes, and these betray the presence of the insect. The larvæ of the case-making species construct small, round, flattened cases of silk and tiny pieces of the material on which they happen to be feeding. During their larval stage they carry their cases about with them, protruding the anterior part of the body when feeding. In this case they pupate and later emerge as adult moths.



Silken feeding tube of the Webbing Clothes Moth, Tineola biselliella.

[Photo.—*A. Musgrave.*

Adult clothes-moths are delicate creatures and may measure about half an inch across the outspread wings. Both larvæ and adults prefer darkness. The work of destruction is carried out solely by the larvæ, as the adults do not feed. The female may lay a hundred or more eggs, and from these the grubs or larvæ hatch, the time spent in the egg stage depending on the warmth of their surroundings. In warm summer weather the larvæ may emerge in a few days, or in colder weather in three weeks. The larvæ commence their work of destruction as soon as they leave the eggs.

[2] R. J. Tillyard, The Insects of Australia and New Zealand, p. 49.

Control.— To keep these destructive creatures out of the house requires constant watchfulness. As the moths dislike light, rooms should not be left with drawn blinds, suggesting the darkened parlours of the Victorian era, and clothing should not be permitted to remain in cupboards or trunks without flake naphthalene or, better still, paradichlorobenzene being kept in sufficient quantity, about a pound per trunk, to keep the garments or furs from moth infestation. When clothes-moth larvæ are found in garments they should be destroyed by fumigation by placing a saucer full of carbon tetrachloride on top of the garments in the box and leaving it closed for forty-eight hours. Carbon bisulphide may be employed in place of the former, but it is *highly inflammable* and, moreover, has a particularly unpleasant odour; smaller quantities, however, may be used. Carpets, rugs, and upholstered furniture should be treated frequently with a vacuum cleaner to keep out the larvæ, and both sides of carpets should be vacuum-cleaned. The baize tops of bridge and billiard tables also require periodical scrutiny. Floor cracks should also be given a "run over" with the vacuum cleaner. The felting in pianos, which is particularly susceptible to moth injury, may be safeguarded by hanging cheese-cloth bags containing about a pound of flake naphthalene or paradichlorobenzene inside the piano.

Flake naphthalene, moth balls or camphor act merely as deterrents, though paradichlorobenzene if used in sufficient quantities in a confined space will kill any moths, larvæ and eggs that may be present. So if it is suspected that garments are infected they should be placed with these crystals in an air-tight box, tin, or wrapped in paper.

If the infestation is very bad, fumigation by hydrocyanic acid gas may be necessary. This task, again, should be carried out only by an expert. Heat of from 165° to 170° F. for five hours is said to kill the moths in all stages, and some warehouses are equipped with special rooms for treating furniture infested by moths.

In North America during the winter months when zero conditions obtain Messrs. Back and Cotton[3] point out that "placing furniture on porches or the roofs of apartments during zero (Fahrenheit) weather will kill all moths within a few hours after the zero temperatures reach the individual moths."

Carpet Beetles.

These tiny beetles do great damage to carpets and to articles of clothing and household furniture, so that one may regard them as rivals of the Clothes-moths. The principal species are those of the genus *Anthrenus*, popularly known as Museum beetles, and the Black Carpet Beetle, *Attagenus piceus*, which last-named has been introduced into Australia. It has been recorded by the late W. J. Rainbow as attacking flannel goods. The slender, reddish-brown larvæ of this oval black beetle are easily recognized by the long brush of hairs at the end of the abdomen, and when mature may measure three-eighths of an inch in length. The larvæ of *Anthrenus* are much more abundant than the previous species, and are short, thick-set, hairy, brown grubs, whose cast skins are common objects.

Control.—The same methods as are given under clothes-moths may be employed. Attention should be paid to floor cracks, as the dust and fluff which collects there provides accommodation for *Anthrenus*.

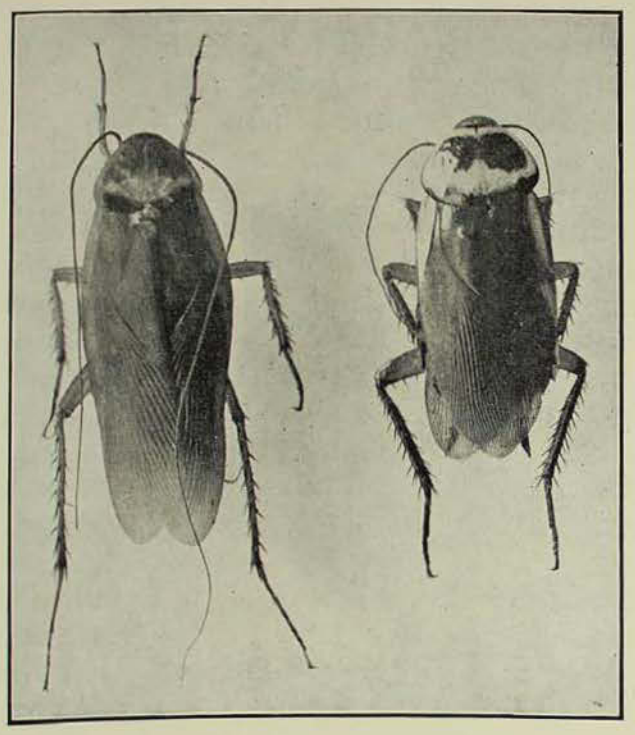
INSECTS WHICH AFFECT FOODSTUFFS.

Cockroaches.

In the kitchens of many restaurants, hotels, boarding-houses, and private homes where proper care is not taken to see that food is left unexposed, cockroaches soon establish themselves, and, after nightfall, scuttle about in search of food. Their presence is often indicated by the unpleasant odour which emanates from certain glands situated between the fifth and sixth abdominal segments. This scent may be quite overpowering in badly-infested houses. Several species of cockroaches (family Blattidæ) are to be encountered in Australian homes, and all

[3] Back, E. G., and Cotton, R. T., The Control of Moths in Upholstered Furniture, *U.S. Dept. Agric. Farmers' Bull.*, No. 1655, February, 1931, pp. 1–32, illustr.

appear to have been introduced from abroad. These are the American Cockroach, *Periplaneta americana*, the Southern Asian or "Australian" Cockroach, *P. australasiæ*, and the little "German" Cockroach, *Blatella germanica*, a denizen of bakeries and wharfs. The first and last named are those most frequently met with in Sydney.



The American Cockroach, Periplaneta americana (left); the "Australian" Cockroach, Periplaneta australasiæ (right).
[Photo.—*G. C. Clutton.*

The American Cockroach, *Periplaneta americana*, is a large reddish-brown species which may attain a length of one and a half inches. The first segment of the thorax has a ring of lighter brown within the margin. The female may lay about 50 or more egg capsules during her life-time, and there are from 14 to 28 eggs in each capsule, though all may not hatch. The capsule is often carried about in a line with the body for a few hours to three days. Incubation varies from 19 to 70 days. Before reaching maturity six or seven moults have to be undergone, the life-cycle being completed in 8 to 19 months. The adult female lives for one to two years, and the male from 6 to 14 months.

The American Cockroach is very much at home in Sydney, and may be seen by the light of street lamps issuing from manholes in the city or suburban streets, while their crushed bodies may be met with on the Sydney pavements almost any summer morning.

The Southern Asian or Australian Cockroach, *Periplaneta australasiæ*, measures about an inch or slightly more in length. The first segment of the thorax bears a bright yellow ring within the margin and a light yellow mark at the bases of the wing covers or elytra. This species was first described in 1775 by Fabricius from specimens from ships from the southern seas and was called *australasiæ*, meaning southern Asian. (It was not until 1814 that the name "Australia" was coined for our continent by Matthew Flinders in a footnote to his book *A Voyage to Terra Australis.*) There appears to be no reason why this continent should be regarded as the original home of the species, which is widely distributed over the globe. When wasp camping on North West Islet in the Capricorn Group off the Queensland coast in 1925, this species came into my tent at night. I have not seen any specimens from New South Wales.

The "German" Cockroach, *Blatella germanica*, is about half an inch in length, light brown in colour, with two dark brown stripes on the pronotum or first thoracic segment. It is quite common in Sydney.

Control.— Powdered *borax* has been advocated as a control measure. This is mixed with equal parts of powdered chocolate or flour, and is said to be an efficient remedy. *Sodium fluoride* blown into the crevices in which cockroaches hide dispels them. A remedy which seems to have had its origin in Australia is the following. One part of plaster of Paris is mixed with four parts of flour and placed in a shallow dish or saucer, while in another saucer water is poured. The dishes or saucers should be so placed that the cockroaches can easily get at the bait and the water. The water causes the plaster of Paris to harden and thus brings about the death of the insect.

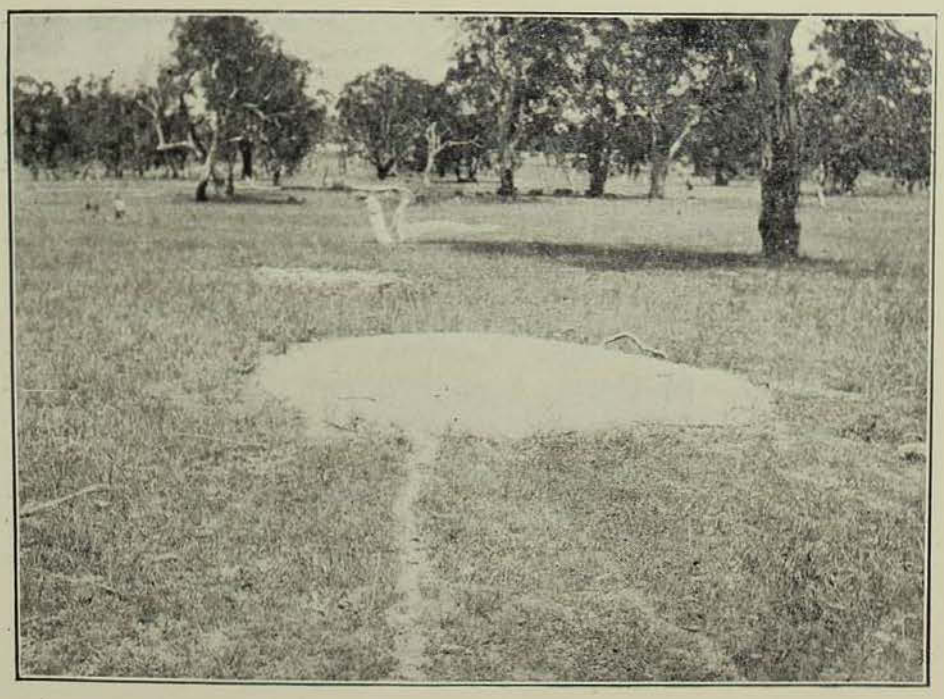
Another remedy is plaster of Paris (one part) mixed with sugar (two parts). A powder recommended by Mr. F. Laing is a mixture of *sodium fluoride* and *pyrethrum*,

consisting of three parts of the former to one of the latter. This is placed about the nooks and crannies in which the cockroaches live and next morning those which have perished may be burned. Care should be taken to see that food does not come in contact with this mixture. Sprays which will stupefy the insects, enabling them to be swept into a fire, are in general use. Such a spray, recommended by Mr. F. Laing, of the British Museum (Natural History) may be made by soaking half a pound of *pyrethrum powder* in one gallon of kerosene for about two hours, and then decanting the mixture. Methyl salicylate or an essential oil may be added, and a fine nozzle should be employed on the spray. *Carbon tetrachloride* may also be used. Where cockroaches occur in numbers they may be destroyed by fumigation; this is best carried out by an expert, who will, in all probability, use *hydrocyanic acid gas*, a very efficient fumigant for all insect pests, and successfully employed in ridding ships of vermin. *Sulphur* fumigation may be undertaken by the average householder as it is a safe and simple method. One objection to it is that it tarnishes metals, and these should be removed before the work of fumigating commences. Two pounds of sulphur per 1,000 cubic feet of space should be burned. The sulphur is placed on an old iron shovel or on a tray, which is placed over a dish containing water in order to reduce the risk of fire, and then the sulphur is ignited by red-hot coals or sprinkled with methylated spirit. The rooms should be made as air-tight as possible and fumigation should occupy an hour or more.

ANTS.

Ants abound in Australia and some of the native species make their way into the house in search of food. In some localities the workers of the Sugar Ants, *Camponotus*, and the Meat Ants, *Iridomyrmex detectus*, are daily pests, and their nests may be at some distance from the house. In the city and suburbs the evil-smelling little black ant, *Crematogaster*, and the tiny Red Ant, *Monomorium pharonis*, are well to the fore. The latter is particularly abundant in some of the large flats and residentials about Sydney, and no effective means of ridding the buildings of the pest has yet come to light owing to the difficulty of locating the nests.

Control.—To destroy ants completely it is necessary first to find the nest so as to be able to kill the queen and the young. The ants seen foraging for food are the workers, which are sterile females, therefore the importance of destroying the founder of the colony will be at once recognized.



Mounds and pathways of the Mound or Meat Ant Iridomyrmex detectus).

[Photo.—*C. Barrett.*

Bisulphide of carbon, which is highly explosive to naked lights, provides the best means of destroying the insects in the nest. A few tablespoonsful should be poured down the openings and then a wet bag placed over the nest so that the fumes may penetrate deep into the interior. Then apply a lighted taper attached to a long stick to the openings so that the resultant explosions drive the fumes still deeper down and break up the galleries. *Calcium cyanide* ("Cyanogas") when placed into the nest openings kills all the returning foragers and those near the

surface, but those in the deeper parts may later emerge scathless. While on a recent visit to the Binnaway Scrub I saw several nests thus treated, and was impressed with the way it kills thousands of ants.

Mr. John Clark, our Australian authority on the group, has given various methods for getting rid of ants in Leaflet No. 139, "Ants as a Domestic Pest", published by the Department of Agriculture, Perth, Western Australia, and I have drawn on this leaflet for the information given below. Baits may be employed when the nests cannot be located. These are of three kinds: (1) honey or sugar, (2) meat, (3) poisoned honey.

(1) Small sponges soaked in diluted honey or sugar-sweetened water are placed about, and when the ants have swarmed over them the baits may be dropped into boiling water.

(2) Bones to which some meat adheres, may be used to attract meat-loving forms and then dropped into hot water when covered with the insects.

(3) A poison bait is made by boiling together sugar 1 lb., honey $\frac{1}{4}$ lb., water 1 quart, arsenite of soda $\frac{1}{4}$ lb., and when the mixture is cool it is placed on sponges as described above.

"The ants take the poisoned honey to the nests to feed the queen and young ants, which are destroyed with the others, thus clearing the nest."

Care should be taken to keep this mixture away from children and animals owing to its very poisonous nature, and it should be labelled "Poison."

NOTE.

While this article was in the press, there appeared an article entitled "Clothes Moths and House Moths: Their Life-history, Habits and Control", by E. E. Austen and A. W. McKenny Hughes, in the *British Museum (Natural History) Economic Series,* No. 14, 1932. In this publication they record from Australia the Common Clothes Moth, *Tineola bisselliella,* Hummel; the Case-bearing Clothes Moth, *Tinea pellionella* Linn.; the White-tip Clothes Moth, *Trichophaga tapetzella* Linn.; the White-shouldered House Moth, *Endrosis lactella* Denis and Schiffermuller; the Brown House (or False Clothes) Moth, *Borkhausenia pseudospretella* Stainton. The two first named are dealt with in this present article.

Reviews

The Great Barrier Reef. By E. M. Embury (Shakespeare Head Press, Sydney). 1933. 8vo., pp. 96, illustrated. Price: 2s.

This forms number three of the series of nature books issued by the Shakespeare Head Press, and is a readable and instructive account of the Great Barrier Reef, one of the greatest natural monuments in the world. The author has made many trips to the Reef as organizer and leader of expeditions, and is therefore well qualified to write of the reefs, islands and animal life of this fascinating region, which is now becoming a favourite holiday resort.

The growth of coral and various hypotheses regarding the origin of atolls and barrier reef are briefly discussed, and the many animals which aid in reef building or live in and about the reefs, cays, and islands are described, including molluscs of many kinds, sea-urchins and sea-stars, bêche-de-mer, crustaceans, and fishes. Sections are devoted to the turtles and the birds, which are so abundant in the breeding season, their nesting colonies being one of the great features of the Reef. There is a fine description of a coral pool, which will give the reader some idea of its entrancing beauty and charm.

The work is illustrated by photographs and by pen and ink drawings. In a work issued at such a moderate price one does not expect expensive illustration, but it is felt that a coloured plate would have added much to its attractiveness.

C.A.

Drums of Mer. By Ion L. Idriess. (Angus & Robertson, Ltd., Sydney.) 1933. 8vo., pp. xviii + 378. Price: 6s.

The islands of Torres Strait, neglected for so long by writers of adventure and romance, have been chosen by Ion Idriess for the setting of his latest book *Drums of Mer*. He presents an enthralling narrative of the hazardous life formerly led by the head-hunting and sea-roving inhabitants of the Strait. The seeker after thrills will have his fill of gruesome detail in scenes of satanic splendour, whereas those unfamiliar with the savagery of head-hunting peoples will be appalled by treacherous night-raids upon sleeping villages and the callous massacre of their entire population—all to sate the thirst for skulls and glory. A picture of unforgettable horror is left on the mind in the firing of a tree-house; the wretched occupants, seared by flames, leap despairingly from the height to meet the relentless caress of the bamboo beheading-knife as they touch the ground. Such descriptions, wherein we pass from peak to peak of feverish excitement, would make exhausting reading but for occasional pauses between raids, when we thankfully turn to gay times of dance and festivity, of laughter and love-making in the hot, flower-scented night. The anthropologist, while recognizing the exigencies of space, regrets that greater attention is not given to the more normal village existence—to the arts and crafts, the economic and domestic affairs of the natives; for war-raids were not an every-day occurrence, they were indulged in when the monotony of peace became unbearable to the young hot-blooded warriors.

The author's genius for story-telling is strikingly apparent in his mode of blending history, romance, and fact with a passion for impartial realism. His abundant zest and verve give speed and buoyancy to a narrative which moves with the rapidity of the great outrigger canoes. The reader may open the book confident that it will compel his undivided attention to the last page.

E.B.

Desert Saga. By William Hatfield. (Angus & Robertson, Ltd., Sydney.) 1933. 8vo., pp. 245. Price: 6s.

The author has given in this book a very realistic and gripping account of the life of a horde of Arunta natives, which is a continuous struggle for existence in a land of little rain.

The most useful aspect of the book, from the anthropologists' point of view, is that it draws attention to the contempt or indifference of the white man for the beliefs, rites and customs of the natives and to the cruelty and slaughter that have often accompanied it. He tells of the efforts of the aborigines to understand the intrusion of a party of gold-seekers, and their hopeless fight against the white man's superior powers. Their willingness to be friendly and to assist when approached in the proper way, is an illustration of what a knowledge of primitive peoples, combined with a sympathetic understanding, can do in an effective administration.

The stealing of the native women by the gold-mining party is a crime which seems to be lightly regarded, but which is, of course, of a heinous nature. It is one of the most unfortunate phases of our contact with the aborigines of Australia; it has been in the past, and still is, the cause of much of their hostility.

The account of the life of the headman from infancy to old age, his gradual loss of faith in the powers of magic, the conflict of white man and black, and the work of the police, is interwoven in a highly interesting and absorbing story.

F.McC.

Impressions of Tasmania

By Keith C. McKeown.

NEARLY three centuries ago, on 24th November, 1642, Abel Janszoon Tasman, in command of the *Heemskerck* and *Zeehaen*, carrying one hundred and ten men in all, sighted the western coast of Tasmania near Macquarie Harbour. They were, so far as is known, the first white men to sight our southern State, named Van Diemen's Land, after Anthony Van Diemen, then Governor-General of the Netherlands Indies, who had placed Tasman in command of the expedition, the object of which was the furthering of Dutch trade in the south seas. The name Van Diemen's Land survived until the middle of the nineteenth century, when it was superseded by that of its actual discoverer, Tasman.

Tasman battled his way, with his two small vessels, round the coast to the south and east, and finally, on 29th November, stood in toward what was later known as Adventure Bay, but finally cast anchor in what is now Storm Bay, only to encounter a fierce north-westerly gale which forced him to put to sea again, to anchor later to the north of Green Island, south of Marion Bay.

One hundred and thirty years elapsed before Tasmania was again visited by Europeans. The next explorer to sight her shores was the Frenchman Marion Dufresne in 1772, in command of the vessels *Mascarin* and *Marquis de Castries*. This expedition was the first to come in contact with the aborigines, in the vicinity of Marion Bay. A quarrel broke out, the natives attacking with spears and stones, only to meet with a volley of musket fire, and one of the natives was killed: the commencement of a long series of these unfortunate episodes following upon the advent of civilized men.

A year later the British came upon the scene, when Captain Furneaux, in the *Adventure*, having become separated from Captain Cook off the coast of New Zealand, sighted the east coast and stayed there for five days.

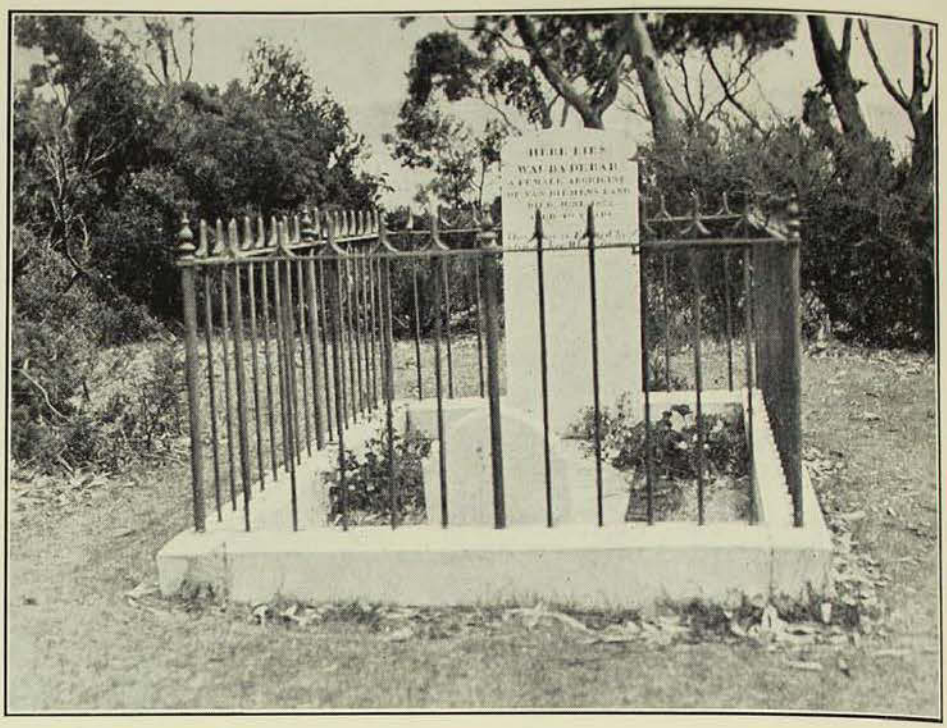
Storm Bay, whence Tasman was driven from his anchorage by a severe storm.
[Photo.—*K. C. McKeown.*

In 1777 Captain Cook visited Tasmania with the *Resolution* and *Discovery*, and anchored in Adventure Bay, an inlet with a unique record in the number of early explorers for whom it provided shelter.

The French adventurers Bruni d'Entrecasteaux and Huon de Kermadec, in the *Récherche* and *Espérance*, spent a month during 1792 in surveying the south-east coast, returning in the following year to complete the work. With this expedition was the naturalist

Labillardière, who collected many examples of the Tasmanian fauna and flora, and to whom we are indebted for information concerning the natives in their untouched condition.

D'Entrecasteaux had intended to anchor in Adventure Bay, but owing to an accident was confined to his cabin, and by an error the pilot put into what is now known as D'Entrecasteaux Channel, and thus discovered this fine waterway. Commodore Hayes visited Tasmania two months after the departure of the French, and, being unaware of the French discoveries, renamed many of the localities explored by his predecessors.



The grave of Waubadebar amongst the sandhills at Bicheno. This memorial was erected by a few of her white friends.
[Photo.—*K. C. McKeown.*

The year 1798 found the *Norfolk* at anchor in the Derwent during the voyage of Bass and Flinders, in which they circumnavigated Tasmania.

In 1802 the *Cumberland*, commanded by Lieutenant Robbins, under orders from Governor King, reached Tasmania, and in a dramatic incident landed a party under the very eyes of the French ships the *Naturaliste* and *Géographe*, commanded by Baudin, and took formal possession of the country in the name of King George, thus forestalling the French in any plans of annexation.

Tasmania abounds in names of historic interest, which perpetuate the names of the early explorers. The name Tasmania itself, Zeehan, Van der Lyn Peninsula, remind us of the Dutch discoveries, while Bruni Island, Freycinet Peninsula and Cape Bouganville and Cape Raoul are among those perpetuating the French.

THE NATIVES.

The aborigines of Tasmania are, alas, no more, and the little we know regarding their life and customs comes to us from the records of the early explorers. The French naturalists Labillardière and Péron have left us accounts of their impressions of the natives, as also has Captain Cook in his "Journal", and all bear witness to the inoffensive nature of Tasmania's original inhabitants, but owing to misunderstandings, mainly the fault of the whites, friction early developed which eventually led to a campaign of extermination in which they suffered from great brutality, especially from bushrangers and sealers.

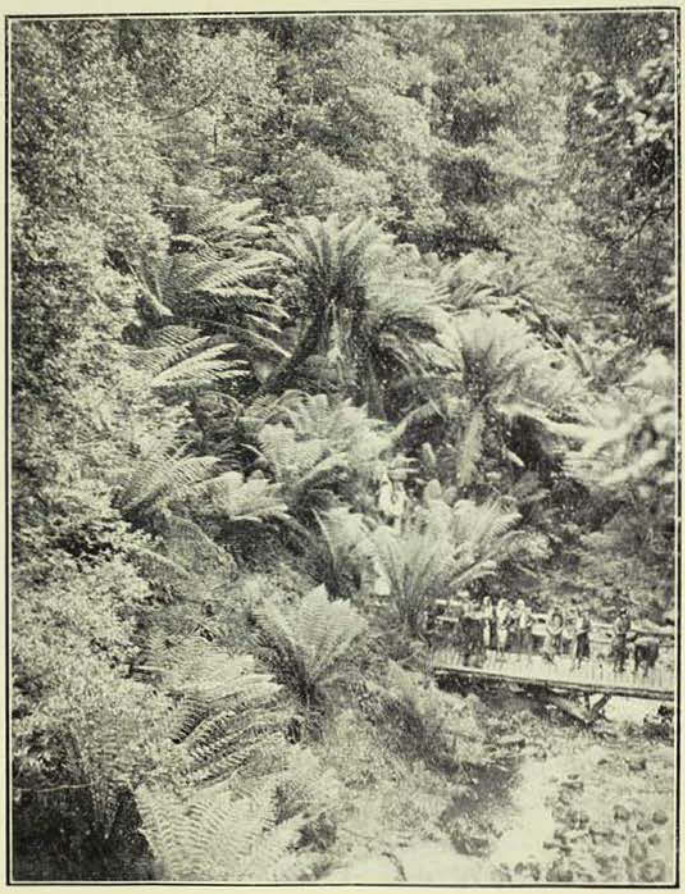
In September, 1830, Governor Arthur organized a great drive, in which three thousand men were employed, with the object of rounding up every native on to East Bay Neck. The drive lasted for seven weeks and cost £35,000, the only result being the capture of a woman and a small boy found asleep in the shelter of a log. Later the aborigines were gradually secured by the efforts of George Robinson and transported to Flinders Island, where they rapidly died out.

A native woman Trucannini is supposed to have been the last surviving full-blooded native of the Tasmanian race, and she died in 1876. Her life was a tragic one: her mother was murdered by sailors, her sister carried off by sealers, and she herself was originally kidnapped, and her lover murdered, by two sawyers in government employ. Although her

pathetic dying request was, "Bury me behind the mountains", her skeleton is on exhibition in the Hobart Museum.

That the natives did have some friends among the whites is borne out by the inscription on the stone on a lonely grave among the sandhills near Bicheno, which reads: "Here lies Waubadebar, a female Aborigine of Van Diemen's Land. Died June, 1832. Aged 40 years. This stone is erected by a few of her white friends."

The culture of the Tasmanians was a very primitive one; they wore no clothing, and their weapons and implements were wooden spears and waddies, and roughly chipped stone tools, which were apparently used for sharpening spears and scraping shellfish for food. Stones appear to have been common missiles in their encounters with the whites. Their food consisted largely of crayfish, shellfish of various kinds, the flesh of the native marsupial animals, and the stems and roots of plants. Their houses, if such a term may be applied to them, were simply rough windbreaks of boughs or bark, placed so as to shelter their fires.



A glade at the foot of Russell Falls, National Park, a view typical of the vegetation in much of Tasmania.
[Photo.—*K. C. McKeown.*

There is a fine group in the Hobart Museum showing a woman cooking crayfish at a fire, at which occupation she is intently watched by a small child, evidently attracted by the smell of cooking food. A man approaches carrying bark for the construction of a shelter.

Péron, the naturalist with the *Géographe* and *Naturaliste*, must surely have been rather susceptible to the charms of the ladies, one of whom he describes as having "spirituel eyes", and speaks of "the softness of her looks, their affectionate and sparkling expression, her lively air and perfect innocence".

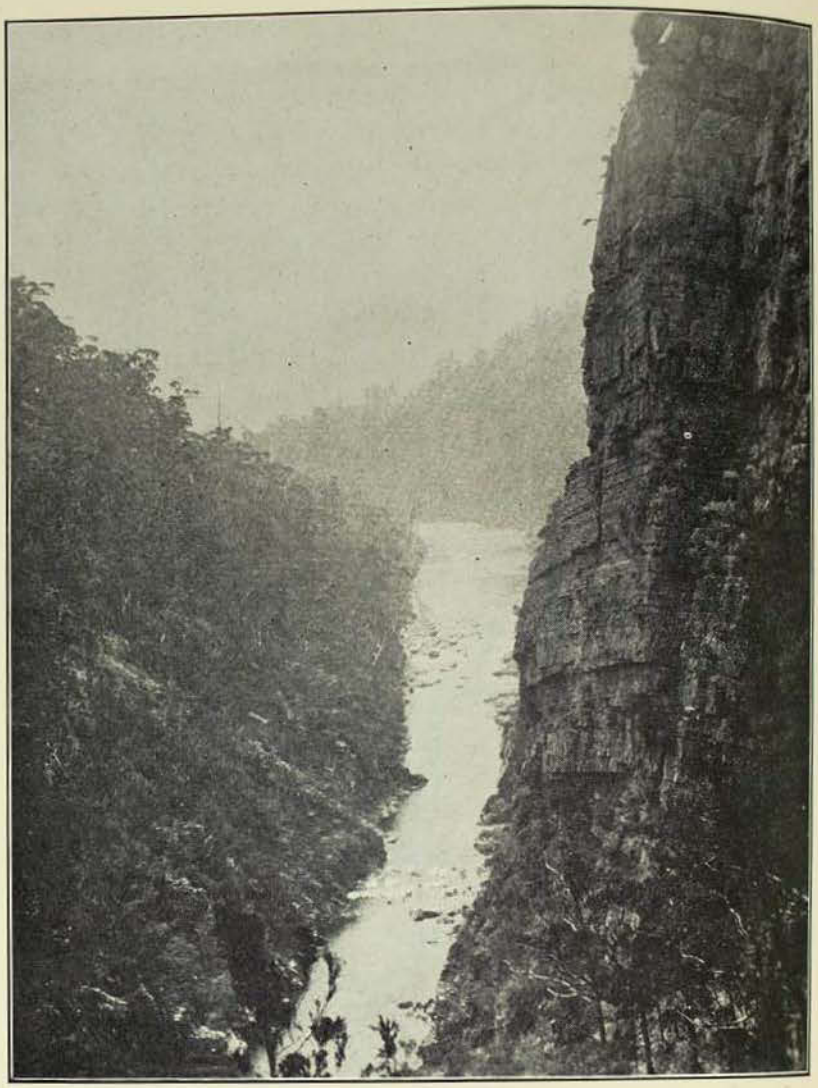
HOBART AND ITS VICINITY.

As one approaches the coast of Tasmania perhaps the first indication of one's proximity to land is the presence of great flocks of Silver Gulls (*Larus novæ-hollandiæ*), which surround the ship, following it with shrill cries through the Channel to the wharves at Hobart. In flying round the ship with so little effort they give one a wonderful impression of bird flight as they drop, ever and anon, to the surface of the water to secure some floating fragment of food, to rise again and resume their flight alongside the ship.

The first view of Hobart, nestling at the foot of Mt. Wellington, whose purple bulk towers above the city, is unforgettable, and one which is always new. Few cities possess such a setting. Mt. Wellington, which rises to a height of 4,166 feet above sea-level, dominating the landscape, has been compared with Table Mountain at Cape Town. Its lower slopes are thickly covered with dense, jungle-like vegetation, but the plateau-like summit is bare and desolate; although it would appear that at one time it was timbered, the trees have been destroyed possibly by fire, which from time to time has swept, and still sweeps, the slopes of the mountain. It is hard to imagine a more desolate

spot than the summit, and this aspect was enhanced on one occasion when our party was caught by a snow storm.

Near the headwaters of the Derwent lies the Tasmanian National Park, and here, among luxuriant jungle of Eucalypts and Beech or Myrtle (*Nothofagus cunninghami*), with its finely divided dark green foliage, and a dense undergrowth of tree-ferns and tea-tree scrub, are several fine waterfalls, the Russell Falls, and, further up the creek, the Lady Barron Falls. At the foot of the Russell Falls are deep glades of tree-ferns, together with tangles of the smaller ferns, dripping with moisture from the spray from the falls.



Alum Cliffs, near Deloraine, where the Meander River has cut its course. Free alum is said to occur here.
[Photo.—*K. C. McKeown.*

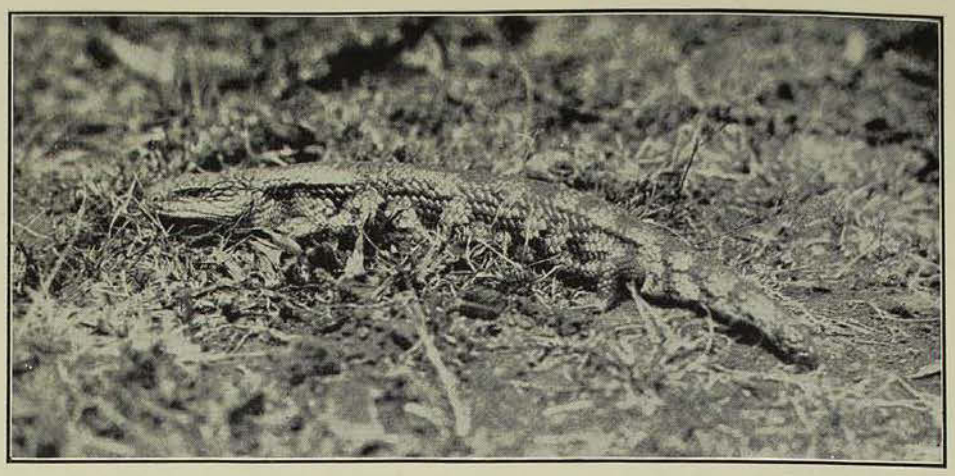
TASMAN'S PENINSULA AND PORT ARTHUR.

On the way to Port Arthur the road passes along the shores of Storm Bay, where Tasman was driven from his anchorage by a gale; a more unpleasant place to be caught in a storm on a lee shore it would be hard to imagine, for the water is very shallow, and it is possible to wade out for a considerable distance; the shallow water lying over brilliant yellow sand is a curious bright green in colour.

Tasman's Peninsula is of the greatest interest both from the point of view of the naturalist and from its historical associations. On the west side of Eagle Hawk Neck lies Norfolk Bay, while to the east is Pirates Bay. The name Pirates Bay is reminiscent of Stevenson's "Treasure Island", and calls to mind pictures of Blackbeard and Kidd. It was here that a party of bushrangers seized a schooner chartered by one George Meredith, and, overpowering him and his crew, they turned Meredith and his carpenter adrift in a small dingy with one oar, and decamped with the schooner. They got clear away, but fate seems to have stepped in when they were off the Australian coast, for here they were eventually wrecked.

Port Arthur was founded in 1830 by Colonel George Arthur, and remained in existence for forty-seven years, until the abolition of transportation. In 1844 there were 7,105 prisoners at the penal settlement, with a force of over 1,000 soldiers. On the horrors of the penal system it is not my purpose to dwell, but it is necessary to point out that not only were hardened criminals transported, but many men, women and children for petty larceny—thefts of articles valued at a few pence. Women prisoners were maintained at the Cascades at Hobart, but, in addition to the men, many boys of ages of from ten to eighteen years were confined at Port Arthur at Point Puer.

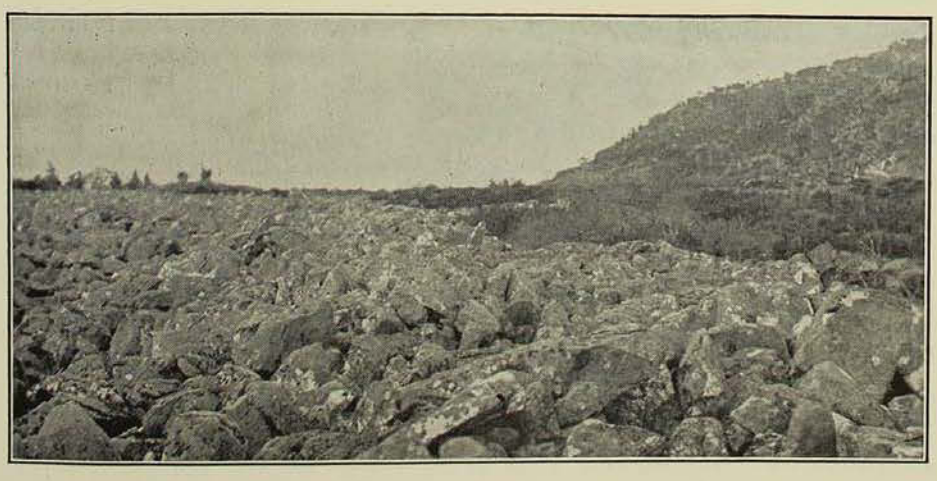
The old church is well worthy of note. It was built entirely by convict labour, but was never consecrated, since in the course of building two men fought in the tower, and one killed the other. The stained glass windows, long since gone with so much more, are reputed to have been painted by Thomas Griffiths Wainewright, the forger and poisoner, who was a skilled artist. Among a number of other crimes, he poisoned his beautiful sister-in-law, Helen Abercrombie, after insuring her life for £3,000. The story runs that someone reproached Wainewright for poisoning Helen Abercrombie. "Yes, it was an awful thing to do", he replied, "but she had such thick ankles."



A Blue-tongued Lizard, near the Alum Cliffs.
[Photo.—*K. C. McKeown.*

Across the beautiful bay, and just off Point Puer, lies the Isle of the Dead, and here some hundreds of convicts lie buried in a few acres of ground—a sorrowful spot for all its beauty.

There is an eery fascination in Port Arthur; it is set in very beautiful surroundings, but the associations of its past leave an ineffaceable impression on one's mind, and on moonlight nights one may well imagine that the ghosts of long dead convicts, clad in their glaring black and yellow prison garb, still march along the avenues of ancient oaks and elms, and haunt the ruined and abandoned buildings, and that the crumbling walls still echo to the clank of leg-irons.



"The Ploughed Field"—an ancient glacial moraine on the wind-swept plateau above the Great Lake.
[Photo.—*K. C. McKeown.*

THE EAST AND NORTH COASTS.

The road along the east coast runs through very broken and rugged country. Two fine passes, Weldborough and St. Mary's, have to be negotiated by the traveller; both of these passes rise to over 3,000 feet. The vegetation on the Weldborough Pass surpasses anything of a similar nature that I have seen in Australia, and is of a very luxuriant character, mainly Eucalypts, Beech or Myrtle, and tree-ferns. In this country Echidnas (*Tachyglossus aculeata* var. *setosa*) are quite frequently seen, while traces of Bandicoots (*Perameles obesula*) were much in evidence, and several of the animals were seen hurriedly crossing the road on the approach of the car.

Black Swans (*Chenopis atrata*) were plentiful on some of the lagoons on the east coast, where they assemble in vast numbers to moult, and they probably give their name to Swansea, a small coastal town possessing a fine bathing beach, which makes it a popular holiday resort.

On the way from Deloraine to the Mole Creek Caves a halt was made at the Alum

Cliffs. The track to the cliffs lies through a farm, and at the farm-house each member of the party was supplied with a stout stick, which we, in our innocence, supposed might be for the purpose of killing snakes, but we soon learned its use, which was to help negotiate one of the steepest and roughest tracks I have ever encountered. The view, however, was well worth the climb. The Meander River has cut a steep-sided gorge through the rock, and now flows like a silver thread at the foot of precipitous cliffs, turning in a right angle almost at one's feet, but hundreds of feet down. The cliffs are reported to contain free alum. At the top of the Alum Cliffs we encountered a fine specimen of the Blue-tongued Lizard (*Tiliqua scincoides*), but we felt that a Komodo Dragon would have been more in keeping with the surroundings.

The shores of the Great Lake, where caddis-flies shelter among the stones. The gum-trees are being drowned by the raising of the water level by the dam at Waddamanna.

[Photo.—*K. C. McKeown.*

MOLE CREEK AND GUNN'S PLAINS CAVES.

Mole Creek derives its name from its course being partly underground, appearing and disappearing several times in the course of a few miles.

Baldock's Cave opens directly into the hillside, and is a typical limestone cavern, or, rather, series of caverns. Lighting arrangements are rather primitive, and its main interest from the naturalist's point of view is the presence in some of the deepest and darkest of the caves of a large spider (*Ectatosticta troglodites*), which spins its snare among the stalactites, and attaches its egg-cocoon, which is about the size and shape of a pigeon's egg, of a creamy-white colour, to the tip of a salactite. The spider is large, but when one crawls through a narrow space, and puts one's head through a small hole to obtain a close view, while stalagmites and stalactites stick into several parts of one's anatomy, and the guide's candle drops hot grease down the back of one's neck, they look positively huge. Only one specimen was within reach, the others being high in the cave, and this I, of course, wanted to secure for the Museum; but I was thwarted by the juvenile guide, who said: "Don't touch 'im, 'ee's been 'ere for forty years."

On the walls of the cave were numbers of a species of Cave Cricket (*Pachyramma* sp.), wingless, with long legs and enormously long, thread-like antennæ many times the length of its body. These insects cling in festoons to the damp walls of the caves and move in greyish-brown masses, thousands hopping in all directions when disturbed. Like so many cave-dwelling insects they are probably blind, and this provides a reason for their long antennæ. The spiders are obviously feeding upon the crickets, but what the crickets live on is a mystery.

Another group of caves, Gunn's Plains Caves, near Ulverstone, possess some fine limestone formations. These caves are lighted by electricity, but here again the chief attraction for me was entomological, a glow-worn cave. When the light is extinguished, and one's eyes become accustomed to the darkness, the velvety black of the roof and walls seems to be studded with myriads of points of blueish-white light, resembling the stars in a

dark sky. These points of light are produced by the larvæ of a Mycetophyllid Midge, minute whitish maggots, like small fragments of cotton thread, crawling about in the moisture on the rocks, and shining with their cold ghost-light.

THE GREAT LAKE.

The Great Lake, a wonderful inland sea of over fifty square miles in extent, lies on a plateau at a height of 3,300 feet. From the north the road rises to the crest or rim of this tableland, almost 4,000 feet in about eight miles, through country of the most rugged and broken description. At one point the road skirts the edge of a great chasm, in the bottom and against the sides of which great basaltic blocks, which have fallen from the cliffs above, lie piled in confusion.

The summit of the plateau is a vast wind-swept plain covered with a profusion of alpine flowers. Here Pine Lake lies on this bare plain, surrounded by pines stunted and tortured into grotesque shapes by the bitter wind which shrieks across the desolate plateau. The water of the lake is a deep blue and the whole place would form an appropriate setting for Macbeth's witches.

Below Pine Lake is apparently a huge glacier moraine, popularly known as "The Ploughed Field", a tumbled mass of great boulders, a relic of the long-gone days when the plateau was ice-capped and huge glaciers ploughed their way down the mountain sides and, on their dissolution, left these great rivers of rounded, ice-polished rocks to mark their course.

On topping the ridge the Great Lake lies spread before one, a great sheet of water, bounded by rock-capped hills and fringed with dead eucalypts, which have been drowned out by the raising of the water level by the construction of the great Waddamanna Dam, which was built in connection with the Tasmanian Hydro-Electric Scheme.

The waters of the Great Lake teem with life: caddis worms drag their cases under the water on the rocky margin, and thousands of adult caddis flies shelter on the lichen-covered rocks and tree trunks by day, to fly on weak, fluttering wings over the surface of the lake on the approach of dusk.

Another curious denison of the water is the Mountain Shrimp (*Phreatoicus spinosus*), a form of great antiquity, and without closely related forms in any other part of the world—a survival of past ages. A fossil form has been found in New South Wales. This genus of shrimps appears to be confined to the alpine regions of southern Australia and New Zealand, and they would seem to stand in somewhat the same relation to other Crustacea as the Platypus does to ordinary mammals. These shrimps and the caddis worms provide a bountiful feast for the trout.

Tasmania holds much to interest the naturalist, even in the more settled parts, but it would appear probable that the less known parts of the west coast will prove to be the home of, as yet, unknown species.

Notes and News

Two exhibitions recently conducted in Sydney, namely, the Natural History Exhibition organized by the *Daily Telegraph* and the Royal Zoological Society of New South Wales, and Bushland Week organized by the Rangers' League, illustrated in a convincing manner the growth of public interest in our fauna and flora. To the former this Museum contributed a series of exhibits of mammals, birds, reptiles, fishes, shells, crustaceans, insects, spiders and other specimens, besides a number of photographs and drawings. The proceeds of this exhibition will be applied to the publishing funds of the Royal Zoological Society. Miss Joyce K. Allan, of this Museum, was the honorary organizing secretary. This was the first exhibition in Sydney to which all scientific institutions contributed. The public was thus afforded the opportunity of seeing *en masse* exhibits from all institutions engaged in scientific activities, and the part each plays in relation to the other. Bushland Week placed before the onlooker the necessity to prize the wonderful heritage of the bush, its denizens, and its flora. The Sydneysider now in middle age remembers the charm of the harbour and its many nooks and reaches, such as Mosman Bay and Rose Bay, once rich in floral profusion and bush life, but with the growth of the city and its suburbs these are mere recollections, and what happened these parts also threatens what is left us further afield. The Rangers' League, by means of its annual exhibitions, of which this was the fourth, is educating the rising generation to cherish what is left to us of our bushland and what dwells therein, which is far better than being compelled by law to respect it. Native flowers, plants, live birds and wallabies, made the exhibition extremely realistic. This Museum was represented by some fine groups, models, and restorations of prehistoric dwellers. Altogether, some thirty thousand attended these exhibitions. The Rangers' League is applying the proceeds of this exhibition to the furtherance of its good work.

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Though the law protecting our unique fauna is very rigid, and the police and customs authorities do their utmost to check illicit trading in skins, it has been apparent for some time past that there have been infractions, as prohibited skins have been listed in considerable numbers on the overseas markets. The subterfuges and artifices devised by the dishonest trader are many and ingenious. Skins prepared by trappers in the country are brought to the metropolis, changing, *en route*, through many hands, and are thence shipped abroad concealed in bales of exportable hides. The police have recently preferred several charges of unlawfully having protected skins in possession, and in one recent case Messrs. H. S. Grant and J. H. Wright, of this Museum, gave expert evidence which assisted the Crown to succeed. In this instance the dealer had a quantity of skins in his possession, eighty of which were proved to have been obtained in contravention of the law. In respect of these he was fined the maximum amount, *i.e.*, £5 per skin, or £400 in all. Salutary lessons such as this should convince transgressors that the game is hardly worth while, and also that the community will do its utmost to preserve Australia's unique fauna against such slaughter. Needless to say, the Australian Museum authorities were pleased at being able to render assistance in this case.

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Lunch hour addresses at the Museum were initiated on August 30, when Dr. G. A. Waterhouse lectured on "Butterflies". This was followed on September 13 by an address by Mr. J. R. Kinghorn on "Snakes and Snake Bite".