

# The AUSTRALIAN MUSEUM MAGAZINE

EDITED BY C. ANDERSON, M.A., D.Sc.



- In the Queensland Bush - - *A. Musgrave, F.E.S.*  
A Probable Relic of La Perouse - - *W. W. Thorpe*  
The Aborigines of Australia - - - *W. W. Thorpe*  
The Bottle and Glass Rocks, Port Jackson  
*F. A. McNeill and A. Musgrave, F.E.S.*  
The Red-Whiskered Bulbul *J. R. Kinghorn, C.M.Z.S.*  
The Emperor Gum Moth and its Allies *T. A. Campbell*  
The Deutsches Museum *Ernest Wunderlich, F.R.A.S.*

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# THE AUSTRALIAN MUSEUM

COLLEGE STREET, SYDNEY

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The Emperor Gum Moth (*Antheraea eucalypti*), a familiar species which exhibits considerable colour variation among different individuals. The two smaller moths depicted are both males, and show the variation distinctly. This plate, though unpublished, was prepared by Harriet Scott for "Australian Lepidoptera and their Transformations," a work written by her father, A. W. Scott, a Trustee of this Museum from 1863 till 1879.

The first volume of this publication was published in London in 1864, and the second was issued by the Trustees of the Australian Museum during the years 1890-1898, to whom the originals of the illustrations now belong.



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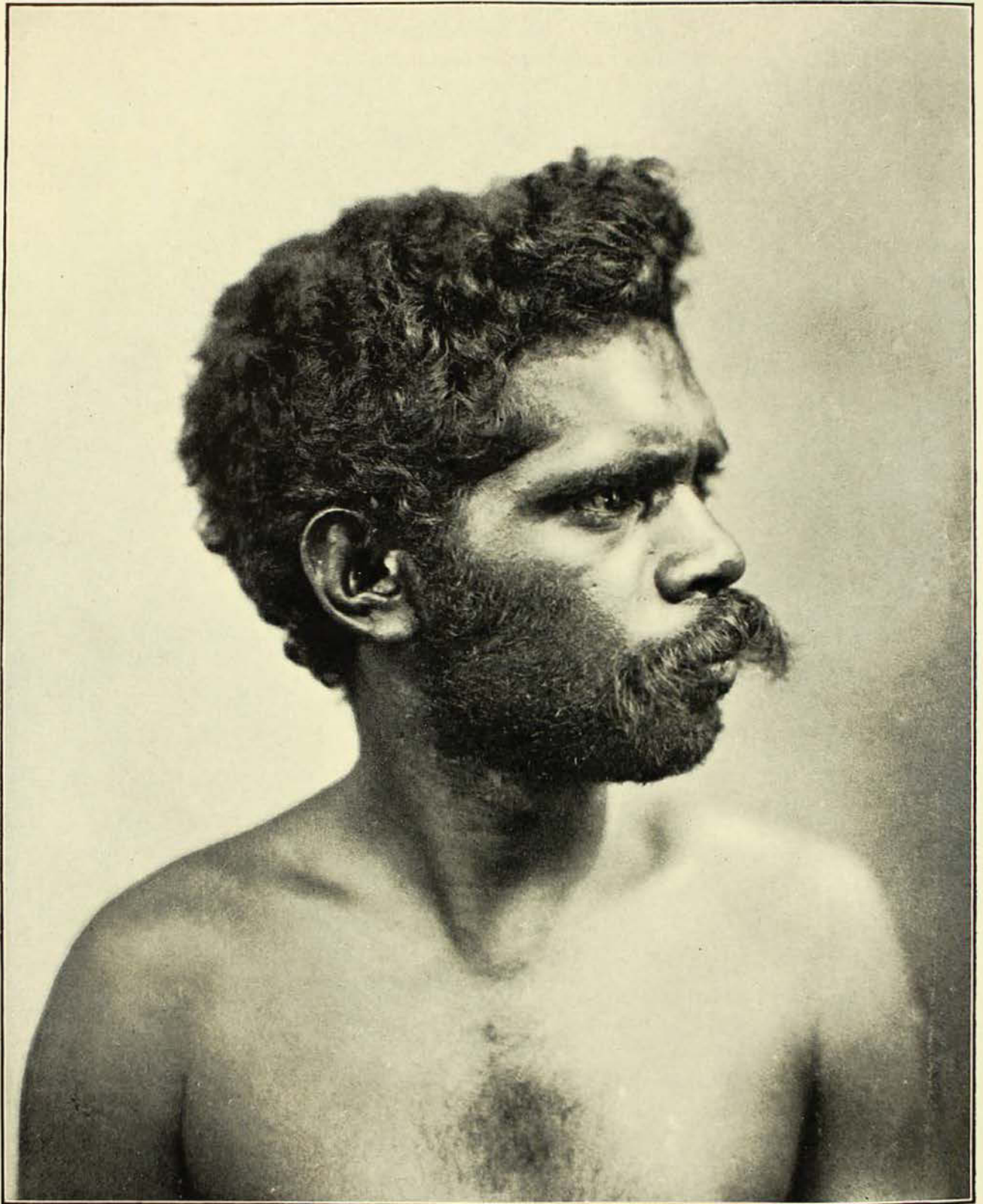
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Australian Aborigine, Port Stephens District  
New South Wales

[Photo—Hy. King (courtesy Tosi and Rohu).]





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JANUARY-MARCH, 1926

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## Editorial.

MUSEUM work has many facets. Perhaps the primary duty of museums is to preserve specimens which have been or will be used for scientific and educational purposes. To the public museums are places where an hour or two may be passed with a certain amount of mild pleasure and profit. To many they are bureaus where information on diverse subjects may be sought, not, we hope, in vain. But one aspect of museum work is apt to be misunderstood and under-estimated by the general public and even by those who ought to know better, and that is their function as agencies in extending the bounds of knowledge.

In the case of zoology, which is perhaps the most important branch in any natural history museum such as ours, there are several independent lines of research, but in the last analysis taxonomy, the correct naming and placing of genera and species, is the foundation of all other zoological studies. Until Linnaeus introduced system into the study of animals and plants there could be, strictly speaking, no science of zoology or botany. The morphologist, whose province is anatomy and structure, the physiologist, who studies the living processes of animals and plants, the geneticist, who concerns himself with

problems of breeding and heredity, the evolutionist, who strives to discover lines of descent and the relationships of organised nature, all these are dependent upon the taxonomist for the exact determination of the objects of their study, without which their researches are incomplete and perhaps misleading.

Taxonomy is particularly, though not solely, the province of the museum worker. Nowhere except in a museum will be found the extensive collections which are necessary for comparison, so that species may be identified, and the many problems of local and seasonal variation, sexual differences, and other perplexing problems successfully attacked.

Matters of economic importance are often submitted to museum officers for their opinion and advice, and they are generally able to give useful information, but a natural history museum is not primarily concerned with economic problems. It is the special duty and the privilege of the museum worker to supply the experimentalist and the economic specialist with certain data essential for the successful completion of his researches. Co-operation is the key to progress where the field is so vast, and economy of effort should be our aim. For example investi-



gation is now proceeding in this State into the distribution and incidence of fluke disease in sheep, a matter which is of great importance to our flock masters and to Australia generally. The organism which causes this disease passes part of its life cycle in certain freshwater snails. The field work and collecting of information from infected areas is being done by others, but the snails which are possible hosts of the fluke are being identified by the conchologist of the Australian Museum, where the specimens necessary for comparison are available. Flies and mosquitoes are the carriers of certain diseases of man and beast, and the discovery of the various links in the chain of causation is one of the triumphs of research, which was rendered possible only by long and patient investigation having for its object the discrimination of the many different kinds of insects involved. It is the part of the medical expert to study the insect and the progress of the disease, but the museum worker it is who is in the best position to identify the genera and species of mosquitoes or flies which transmit the diseases. In erecting a building workmen skilled in various branches co-operate to produce the finished structure, and the same principle applies in the ramifying and interlocking operations which contribute to the construction of the noble and ever growing edifice of scientific achievement.

Australia is still so young that but a fraction of its animal population has been properly determined, and the workers are so few that many years of strenuous labour are necessary before anything approaching an adequate knowledge of our fauna can be attained. In this work museums have an important part to play, both by direct contributions through the work of their own officers, and indirectly by facilitating the work of others. For this purpose it is essen-

tial that the collections should be systematically arranged on scientific lines, and readily accessible to students, and much of the time of museum officers is devoted to this work, which many people would consider humdrum. New accessions and the revision of old material necessitate rearrangement on modern lines so that the work is never finished.

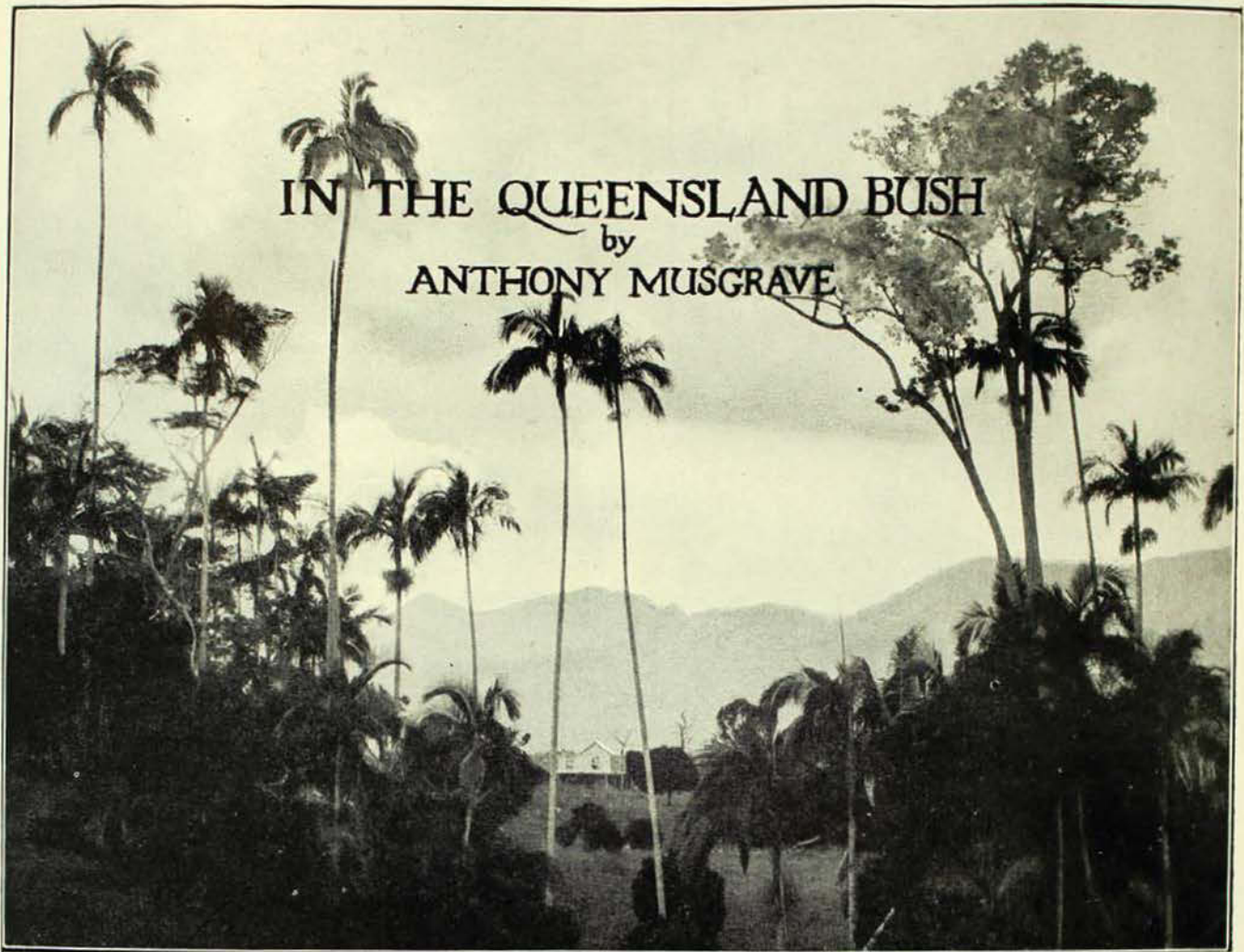
No museum has a staff large enough to deal with all groups; for example no entomologist can hope to be a specialist in more than a few orders, but he is expected to have a sufficient acquaintance with the whole field of entomology to be able to sort his specimens into their natural groups, so that, when opportunity offers, they can be submitted to some specialist at home or abroad. Thus we often find it necessary to enlist the aid of workers in other states and New Zealand, or in Europe or America, who are glad to have unworked collections for examination and study, and to return named specimens to form the basis of a reference series invaluable for future workers. We on our part are ever ready to reciprocate so far as we are able.

But it must not be supposed that the work of a museum zoologist consists entirely of classification, labelling, arrangement, and preparation of specimens for exhibition. It will be gathered that there is much routine work to be done, and that but little time can be left for research, the highest grade of scientific work. Yet much research is done, and we can point with pardonable pride to the published results of original work carried out by officers of the Australian Museum. The museum officer's work is never finished, for there are always new species or varieties to be described, or families which require revision work which often entails a close and systematic study of large series of specimens, and a critical survey of scientific papers which have already appeared.

The October issue of *Building* contains a fine article upon the Australian Museum, showing what it is, and what it some day aspires to be. Besides, illustrating our own institution, those of Europe and America are also featured, and it is shown what may be done provided funds are sufficient. The

group-work of our staff has been favourably commented upon times without number by visitors from overseas museums. Given the necessary cash there is no reason why we should not do as well here as abroad. Thanks are due to the editor of *Building* for having devoted so much space—a dozen pages—to us and our doings.





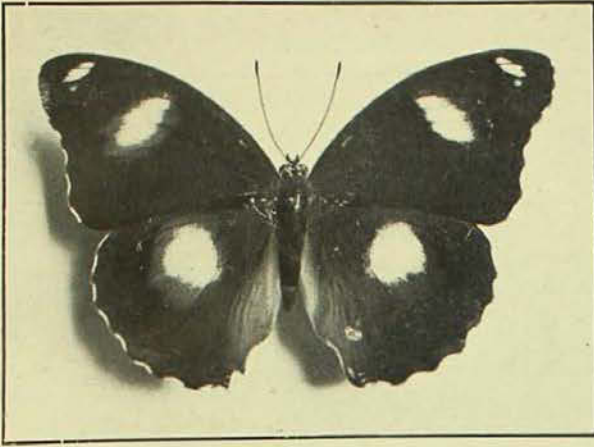
IN THE QUEENSLAND BUSH  
by  
ANTHONY MUSGRAVE

THE Queensland bush holds so much of interest to the naturalist that when an opportunity was afforded to the members of the Royal Australasian Ornithologists' Union to visit Rockhampton for their annual conference, and to proceed thence to the Byfield scrubs for a camp-out, I eagerly signified my intention of joining the party. Members from most of the States attended and about a week was spent in Rockhampton, meetings being held during the morning in the School of Arts at which his Excellency Sir Matthew Nathan, the Governor of Queensland, presided, while during the afternoons we were usually taken by car to some picturesque spot near the city, where the ornithologists were able to observe the birds and the entomologists of the party to collect insects. These outings were extremely profitable and

enjoyable, and I look back with delight on the pleasant times spent with our Rockhampton friends.

Our first excursion was to Fairy Bower, an interesting patch of scrub some six miles out of the town. On our arrival, we heard a dreadful screeching noise coming from the summit of some trees, and presently a large bird flew out, which was identified as a Channel-bill Cuckoo or Giant Cuckoo, also known as a Storm, Flood, or Rain Bird (*Scythrops novae-hollandiae*). It occurs in Celebes, Flores, and the Moluccas, and is said to follow the flood waters of the rivers of the Gulf of Carpentaria watershed down to Cooper's Creek and Lake Eyre. It is a large grey bird, one of the largest of the cuckoos, and its large bill makes it conspicuous and easily recognisable.



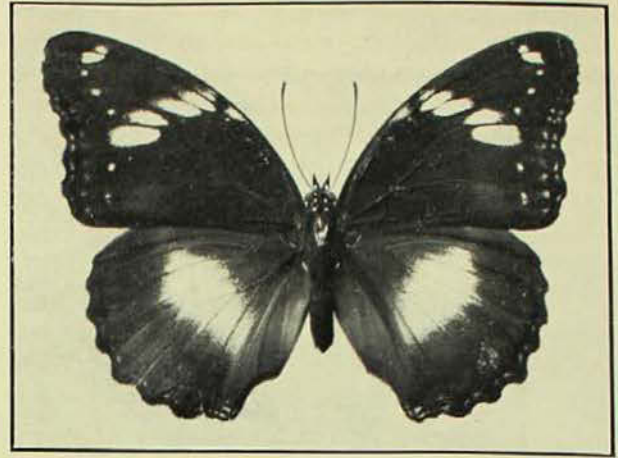


Male of the Blue-eyed Butterfly (*Hypolimnas bolina*), a widely distributed species.

[Photo.—A. Musgrave.]

Insects were abundant, and among my captures was the Blue-eyed Butterfly, (*Hypolimnas bolina*), which ranges from the Himalayas in India to far away Samoa. Various geographical races occur throughout its wide range but the finest and largest race occurs in Australia. The species comes as far south as Sydney, but it is rare in these parts though abundant in Queensland. The male is easily recognised by its rich, black, purple colouration and the large blue-ringed white spots in the centre of each wing. The female is brown black above with a bar of large white spots dusted with blue. The hind-wing has a large central patch. The females vary greatly in markings and colouration while the males remain constant.

At Fairy Bower I saw growing for the first time a queer fig-tree, whose name I have since learned to be *Ficus glomerata*, the Cluster Fig-tree or Leichhardt's Clustered Fig, a tree with a wide distribution from Queensland to Asia. It is an ever-green tree and grows from 40 to 60 feet in height, but its chief peculiarity lies in its fruit, which instead of growing from the ends of the branches,



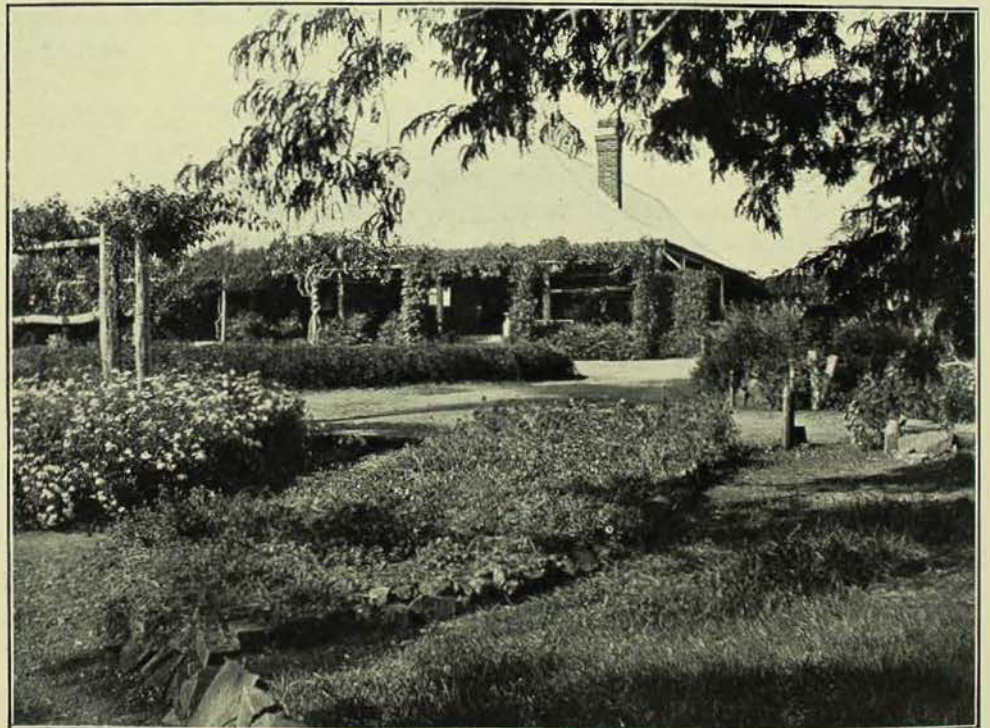
The female of the Blue-eyed Butterfly (*Hypolimnas bolina*), a very variable insect.

[Photo.—A. Musgrave.]

hangs from stems all over the trunk of the tree. These figs are said to be relished by the aborigines of Australia.

#### GRACEMERE STATION.

On another afternoon we visited Gracemere station as guests of Mr. and Mrs. R. S. Archer. This famous cattle station is situated about seven miles from Rockhampton, and is the home of the Archer family who arrived in Australia many years ago from Scotland. The station is beautifully situated on a point which juts out into a large mere or lagoon,



Gracemere Station, the home of the Archer family, and the spot from which Carl Lumholtz made his trips into the surrounding country. [Photo.—A. Musgrave.]



about a mile long and half a mile wide, from which it derives its name of Gracemere. The homestead is practically the same to-day as it was fifty years ago when it was figured by Carl Lumholtz, a Norwegian naturalist, in his book entitled, *Among Cannibals*. Its verandah is embowered in creepers, while the garden in front of it was a mass of flowers on our arrival. Surrounded by beautiful trees such as palms, Poincianas and Jacarandas, which latter were a blaze of blue blossoms on our visit, Gracemere station stands like a delightful oasis among the sparsely timbered country surrounding it. Lumholtz has written at length of the botanical glories of Gracemere, and the trees I have enumerated were all in existence in his day. The station is a bird sanctuary, and the birdmen were able to train their binoculars on to pelicans and other aquatic birds. About a mile from the homestead there is a patch of scrub, a continuation of that of Fairy Bower, and here the entomologists collected many insects and the birdmen added various scrub birds to their growing lists.

#### OLSEN'S CAVES.

The next morning we started off on an all day excursion to Olsen's Caves, a series of limestone caverns which lie about 18 miles from the city. These caves are on the property of a Mr. Olsen, who acted as our guide, and the approach to them is very charming, as trees above and in front of the cave entrance send down long garlands of vines which make a very effective setting. Candles were issued to us, though I had provided myself with an acetylene lamp, and then we set off on our tour of exploration. We passed right through the hill in which the caves are situated, and came out on the other side. The caves have not yet been fully explored, and the part we saw was very dry and the formations poor, not even comparable to those of the Belubula Caves near Mandurama, New South Wales, which Dr. Anderson and I explored some years ago.<sup>1</sup> One of the most interesting things seen in the caves, were the long roots of the fig-trees from whose branches hang the streamers of vines over the cave entrance. The way these limestone caves come to be formed is a very interesting



Entrance to Olsen's Caves near Rockhampton.

[Photo.—A. Musgrave.]

story and one which Dr. Anderson has related in his article on the Belubula Caves.

Caves are the natural homes of bats, so when I visited Olsen's Caves I went prepared to collect some for the Museum by taking a shot gun and cartridges, and I had there the good fortune to secure some False Vampire Bats, *Megaderma*. These I shot more by good luck than good management, for they were in a very high part of the cave and by the light of my lamp I could only see a few dark forms flying about and hear their twittering cry. They eventually settled in a dark corner into which I fired and succeeded ultimately in shooting three, one of which fell in a crevice high up where it was unprocurable. The other members of the party moved to another part of the cave when I commenced firing, being afraid that the explosion might dislodge stones from the roof.

At Olsen's Caves we saw our first Frilled Lizard, *Chlamydosaurus kingi*, which was captured by Mr. H. Longman, the Director of the Queensland Museum. While he was holding the animal for us to photograph, it succeeded in escaping and rushed for a nearby tree with Mr. Longman in pursuit.

<sup>1</sup>*Aust. Mus. Mag.* II., No. 1, Jan., 1924, pp. 12-17.





The Frilled Lizard (*Chlamydosaurus kingi*) with half erect frill. We met this lizard at Olsen's Caves and Byfield. [Photo.—A. Musgrave.]

We did not observe it run upon its hind legs in the attitude which Saville Kent has photographed, but it covered the ground in the manner of a water lizard and with considerable speed, but not being sufficiently agile to escape its pursuer was overtaken ere the tree was reached. When annoyed, the animal would open its mouth, and the membranous frill which usually lies folded about the neck, would at the same time expand so that it stood out like an Elizabethan ruff, the warning colours of red and yellow presenting a beautiful if somewhat terrifying appearance to the onlooker. The Frilled Lizard is quite harmless despite its threatening appearance, for its teeth are small and the jaws weak, and, according to Saville Kent, who kept the animal in captivity, it rarely attempts to bite.

#### YEPPOON AND ITS INSECTS.

From Rockhampton we departed for Yeppoon, as this was the appointed place from which we were to leave for our camp-out

at Byfield, a spot which had never been visited by naturalists.

Yeppoon is one of the sea-side resorts of Rockhampton, and is about 35 miles from the city, being situated on Keppel Bay. Yeppoon has a fine beach "the best in Australia," so one of the residents informed me, and it certainly was a beautiful beach with a very hard sand. The surf was rather poor, as the Keppel Islets, about 12 miles from the coast, break the force of any swell. A range of low hills runs parallel with the beach for some distance, and at their feet lies a road which runs north. These hills were covered with low jungle, with clearings here and there indicating the home of some banana grower. Between the road and the beach is a narrow strip of vegetation overgrowing the sand-hills, and this and the jungle on the hills, yielded us our birds and insects. From the Sunday when I arrived until midday on Wednesday when we left for Byfield, I spent a most profitable time photographing and collecting insects, spiders, and shells.

Yeppoon proved to be very rich in insect life, and in the scrub at a short distance from the hotel, numbers of butterflies were to be seen.

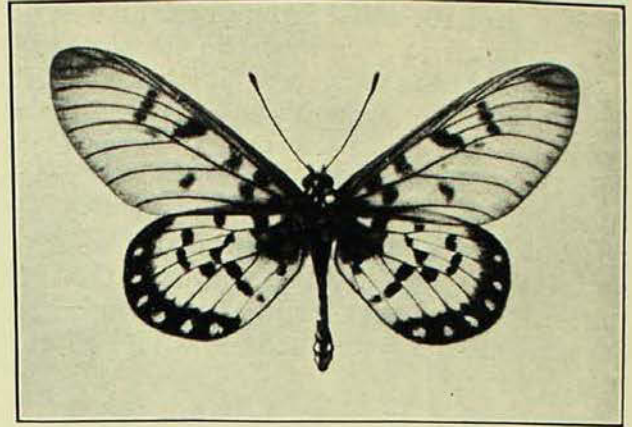
The Yeppoon fauna is considered to be a mixture of Cairns and Brisbane faunas, though some of the northern forms do not extend south of Yeppoon. The butterflies most common at Yeppoon were members of the family *Nymphalidae*, the largest family of the butterflies. In these insects the fore-legs in both sexes are so reduced as to be useless for walking. The family is sub-divided into a number of subfamilies, and one of the most interesting is the subfamily *Danainæ*, which has reached its highest development in the Indo-Australian region. This subfamily includes a number of forms which are all strikingly marked with red, black, yellow, and green, and are chiefly remarkable for the fact that they are seldom if ever attacked by birds due to their possessing a pungent nauseous fluid in their bodies. This unpleasant taste has been attributed to the habit of the larvae of feeding on different kinds of milkweeds and allied plants which exude a milky fluid when their stems are broken. They have a lazy flight, and appear to be quite free from fear of enemies.

The commonest species at Yeppoon was the Blue Wanderer, *Danaida hamata*, a species



with a range from Shoalhaven to Port Darwin, but is rarely met with about Sydney, though it has been captured in the Botanic Gardens. Its rich pearly-blue and black form was everywhere conspicuous along the roads at Yeppoon. In its caterpillar state it feeds on various climbing plants.

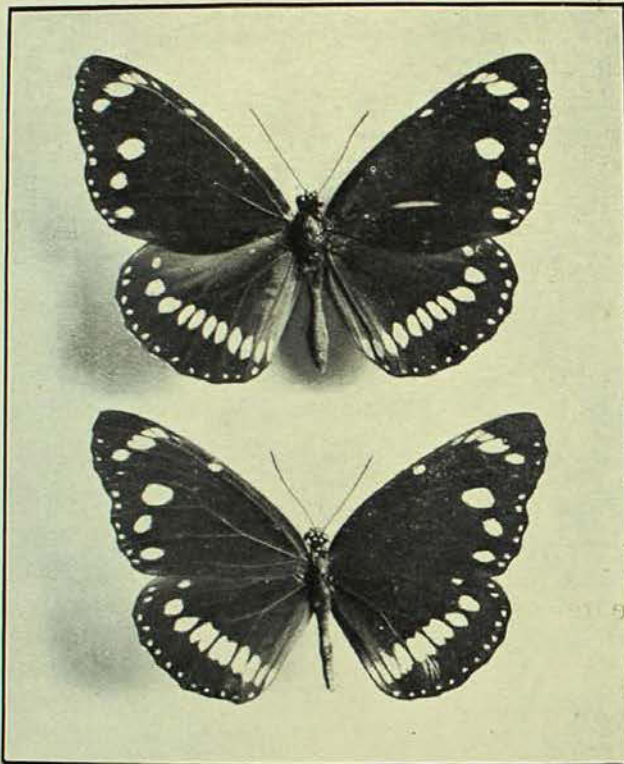
Another interesting Danaid butterfly was *Euploea corinna*, the only species of the genus *Euploea* that extends so far south as Sydney, and it is the commonest species of the genus. The male may be recognised from the female by the fact that the hind margin or dorsum of the fore-wing is convex, while



The Glass wing, or Greasy (*Acraea andromacha*) a common Queensland insect. [Photo.—A. Musgrave.]

distinguished by having the wings elongate, while the caterpillar is cylindrical and covered with bristles or spines. They have a slow flight and often settle. They also appear to be free from attacks by birds and some have been shown to be distasteful to the insect-eating mantids. The Greasy has a range from Cape York to Sydney, but occurs also in New Guinea, New Hebrides, Fiji, and Samoa. The caterpillars feed on passion vines. The adult butterfly has the fore-wings transparent with dark markings, while the hind-wings are opaque and yellowish-white marked with black.

Another beautiful Nymphalid butterfly secured was *Cupha prosope*, a reddish-brown species which haunts the sunny forest glades of Yeppoon. It ranges from Cape York to the Richmond River in N.S. Wales, and was poorly represented in the Museum collections until I secured a series at Yeppoon.

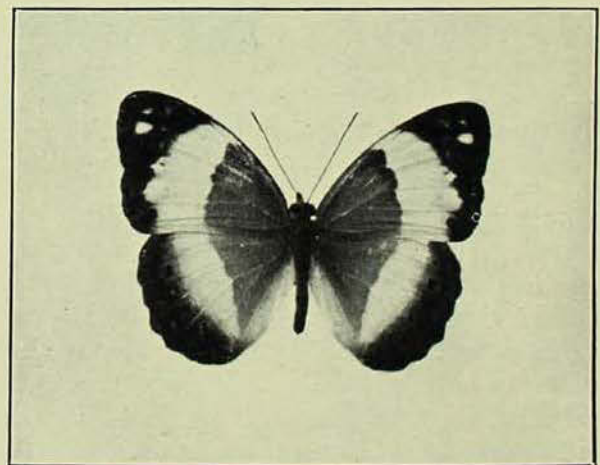


The black and white *Euploea corinna*. Male above, female below.

[Photo.—A. Musgrave.]

in the female it is straight. A scent gland is also present on the fore wing of the male and absent in the female. The butterflies of the genus *Euploea*, which are practically confined to the Indo-Australian region, reaching their highest development in New Guinea, are all dark-brown or black in colour with white markings.

The Glass-wing butterfly, *Acraea andromacha*, also known as the Greasy, occurred abundantly at Yeppoon. It belongs to the same family as the Danainæ, but is placed in a different subfamily, the Acraeinæ, which is



*Cupha prosope*, one of the original discoveries of Captain Cook's party at Cooktown. [Photo.—A. Musgrave.]



It was first recorded from Australia in 1775 by Fabricius, a pupil of the great Swedish naturalist, Linnaeus, and it was described from specimens brought back by Banks and Solander, the naturalists on Captain Cook's ship the "Endeavour." The "Endeavour" touched at only two points on the East coast of Australia, Botany Bay and Cooktown, and it was at this latter place that this butterfly was first collected. The insect is sometimes captured at Brisbane, but there it is a rarity.

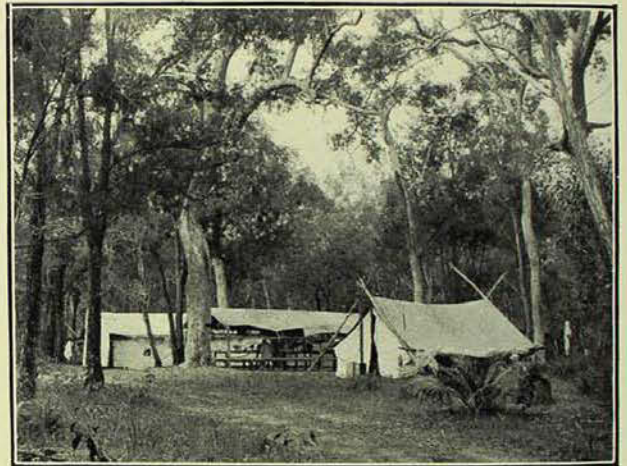
#### GREEN TREE ANTS.

At Yeppoon I was delighted to see once again the nests of the Green tree ant, *Ecophylla smaragdina*, an insect with which I had been on familiar terms in New Guinea as a child. This ant has a wide range throughout North Australia and New Guinea, and ranges to Africa, and wherever it occurs the remarkable nest which it constructs among the branches of living leaves bent over and joined by a silken web, has earned it man's unstinted admiration.

If a leaf is required to form part of the nest and it is not too far away, numbers of ants seize hold of the edges of the leaf in their jaws and haul with might and main until they have got it into position. Then others bring from the interior of the nest half-grown larvae, which are held by the middle of the body with their heads forward and touching the edges of the leaves so that the thread they excrete may bind the leaves together. Each larva is carried up and down the edges of the leaves excreting thread the while until its supply is exhausted, when other larvae are requisitioned until the edges are eventually matted together by strong web.

In the event of a leaf being too far away for an ant to span the gap with its body, a chain is formed. An ant seizes hold of the leaf in its jaws, another grasping its body from behind, while others fall into line, each grasping the body of the ant in front, thus forming a living chain. Some of these ant chains, according to Mr. F. P. Dodd, who has studied their ways, may be from two to three inches in length. While at Yeppoon I did not see them forming these ant chains, but I saw them busy at work on their nests and on intruders. As they frequently mat the leaves together, one often breaks through their leafy abodes, with the result that they shower, down one's neck.

They are vicious little beggars, usually preferring to have their bodies pulled from their heads, rather than relax their hold. They do not sting like a green-head ant, but depend on the power of their bite. When they see anyone approaching the nest they have the curious habit of standing on their hind pairs of legs and stretching themselves out their full length as though yearning to bury their jaws in the skin of the intruder. At Byfield, near Yeppoon, I saw some of these Green-tree ants carrying off the body of a march-fly. I wanted the fly for the Museum collection, so I picked it up with my forceps and tried to dislodge the ants, but they retained their grip even in the killing bottle, with the result that they are still attached to the fly.



The R.A.O.U. camp at Byfield. A cycad (*Macrozamia*) in the foreground.

[Photo.—A. Musgrave.]

#### BYFIELD CAMP.

After spending a few profitable days at Yeppoon the majority of the party, twenty-six in all, left for Byfield, some twenty-five miles distant. We journeyed thither by char-a-banc into which we were compressed like sardines, and, as the road was very bad and the brakes frequently refused to act, the trip was not devoid of incident. Once we had a very narrow escape from capsizing, but at length we sighted the tents of our camp and shortly afterwards found ourselves among the residents, who had turned out to welcome us.

They had, we found, erected tents, made bunks for the men of the party and provided stretchers and mattresses for the ladies, and erected a dining tent and a table with a split piccabeen palm trunk for a seat on either side. The table was decorated with flowers



while bunches of bananas hung from the roof. Byfield owes its status as a district to a number of banana-growers and farmers who have hewn out the dense jungle on the slopes of the Mt. Parnassus range, to make way for their plantations. It was on the slopes of these mountains that we did our bird recording and insect collecting. The lowlands with their open forest, though possessing an interesting



The Princess Alexandra's Palm (*Archontophenix Alexandrae*), known also as Piccabeen Palm.  
[Photo.—A. Musgrave.]

fauna, are not as rich as these islands of Indo-Malayan jungle set in a sea of Australian forest. Numerous small creeks ran down the mountain side, to find their way eventually into Water Park Creek, a large stream which flows into the sea. One of the most beautiful features of the bush at Byfield were the numbers of palms which grew along the banks of the creeks and gullies, in places forming dense feathery groves. This palm I am informed by the Queensland Government Botanist, Mr. White, is the Princess Alexandra's Palm, *Archontophenix Alexandrae*, which is known locally as the Piccabeen Palm, though this later name is also given to another species of *Archontophenix*. The Princess Alexandra's Palm is a tall species with a stem which may attain to a height of 70 to 80 feet, and it is crowned with fronds which have the habit of turning sideways on their axes, so that

they differ in appearance from the well-known Lord Howe Island Thatch Palms, whose leaflets hang straight down. It is restricted in its range and prefers certain soil and climate, and for this reason, I am told, the Lord Howe Island Thatch palms, which are much hardier and just as beautiful, are to be preferred to our Australian palms of the genus *Archontophenix*. Nevertheless the Byfield palms were a source of aesthetic joy to us, and their bunches of scarlet seeds helped to brighten the sombre scrubs.

#### BOWENIA.

On arrival at the camp we found that the residents had decorated the poles of the dining tent with the leaves of a beautiful cycad called *Bowenia serrulatum*. According to Professor Chamberlain of the University of Chicago, who is an authority on cycads, three genera occur in Australia, and these are *Cycas*, *Bowenia*, and *Macrozamia*. These three genera occur commonly in Queensland and the North-east of Australia, and *Cycas* and *Bowenia* are believed to be confined to this region, though *Macrozamia* extends into New South Wales and West Australia.



The curious Byfield Cycad (*Bowenia serrulatum*) grew in small thickets near our camp.  
[Photo.—A. Musgrave.]

Cycads are queer plants, something like a palm in general appearance, and some of our species are called popularly zamias after the scientific name *Macrozamia*. The members of the genus *Bowenia* are quite unlike other cycads in appearance, and are distinguished from them by the fact that the leaflets are



arranged in pairs (bipinnate). The leaflets of *Bowenia serrulatum* are dark glossy-green in colour, and present the appearance of having been varnished, while each leaflet, too, is serrated. These leaves retained their freshness for days while tied to the poles in the fierce heat of the tropic of Capricorn. On the banks of a small creek close to the camp we found the plant growing in small but dense thickets. This curious plant is restricted in its range to a small area in the Rockhampton district, its ally *Bowenia spectabilis* occurring 400 miles further north.

#### THE BANYAN.

Near a large banana plantation about a mile from our camp grew a magnificent banyan tree to which a Byfield resident, Mr. W. Mortensen, motored us soon after our arrival. This giant fig, *Ficus cunninghamii*, dominated the surrounding bush, its horizontal branches giving off long aerial roots to the ground, its huge crown of verdure spreading far and wide over the palms growing on the banks of a little stream, recalling memories of Lord Howe Island, where the Thatch Palms grow in some banyan's shade. The Byfield species somewhat resembled that of Lord Howe Island, but was much taller and differed in the size of the leaf and other characteristics.

#### FLYING FOXES.

On the evening of our arrival at Byfield we walked over to a neighbouring farm to see the flying foxes come from their camp among the adjacent scrubs. First a few individuals passed over head, and then to the right and left as far as the eye could see they flew over in countless thousands, and for more than half an hour the air was filled with the noise of the beating of their wings and the unpleasant scent from their bodies. Some flew down as though looking for blossom-laden trees, but the main body passed onwards towards the coast. Later in the evening, the turpentine trees surrounding the camp were filled with the squealing brutes, which had come to feed on the honey in the blossoms. Next morning most of us set off for the flying fox camp, being driven there by Ford lorry. We pushed our way through thickets of lantana and ultimately arrived at the camp. Here there was little to see, as the camp was situated among scrub so dense that all that

was visible of the millions of individuals which constituted this flying-fox city, were a few dozen forms hanging like cocoons from the branches of trees which showed through gaps in the foliage, or else climbing and squealing and fighting among the branches.

Our presence disturbed a greater number, and a noise like the pounding of heavy surf or a mighty wind in a forest sounded above us as the animals wheeled over the tree-tops. A baby flying-fox was seen clinging to the branches of a palm tree, and Mr. Harry Barnard, a well known Queensland naturalist, climbed for it and brought it down. Mr. Barnard is a wonderful climber, and in his younger days used to have climbing contests with the blacks. During our stay at Byfield I shot several adult flying-foxes and brought them back to the Museum, where my friend Mr. Troughton identified them as *Pteropus scapulatus*. My chief interest in collecting flying-foxes was to secure the curious aberrant flies known as Nycteribiids or "bat ticks," which live among the fur and feed on their hosts. They are quite devoid of wings, but are remarkably fleet of foot, and many a chase I had before I eventually caught the tiny animal and plunged it into a tube of spirit.

#### BIRDS.

The ornithologists were rewarded at Byfield with several important finds. One of the most interesting was that of the Fairy warbler, *Gerygone flavida* Ramsay, a species which for many years had been considered to be merely the female of *Gerygone personata* Gould. Dr. Ramsay's specimens had been collected at the Herbert river district North Queensland, so that our finding it at Byfield extended its range over 400 miles southward. Its nest had been met with at Fairy Bower, but no opportunity then had arisen of identifying the species. It was only when some skins of the bird were brought back from Byfield to be compared with Ramsay's types in this Museum, and there seen to be identical, that a doubt which had existed for nearly 50 years was cleared away. The Fairy Warbler, like its ally *Gerygone personata*, has the habit of frequently building its nest near that of a wasp, and one of the nests seen at Fairy Bower was built in such a situation.

Another interesting find was the Jungle-fowl or megapode, *Megapodius reinwardt*,



whose most southerly record, prior to our meeting with it at Byfield, was from the vicinity of Mackay and on the Whitsunday Islands off Port Denison. The Jungle-fowl is one of the three famous mound builders which occur in Australia, the other two species being the Scrub Turkey and the Mallee-fowl. The birds all construct large mounds of sticks, leaves, and earth in which they lay their eggs, the mounds serving as incubators for the developing chicks.

During the time we were at Yeppoon and Byfield the season was dry and not the best time of the year from an insect hunter's stand-

point, but nevertheless Dr. Jefferis Turner, a well known entomologist, has recently published a list of butterflies and moths collected by himself and other entomologists of the party, the number of species amounting to 407, of which 57 were butterflies, constituting as Dr. Turner has pointed out "an entomological foray of some magnitude."

The liberality of the Queensland Government and the hospitality of the Rockhampton and Byfield people contributed so much towards making the trip a success that the members had every reason to enjoy their brief sojourn in the Queensland bush.

## A Probable Relic of La Perouse.

BY W. W. THORPE.

THE shoe-buckle illustrated on this page was found at Vanikoro in the Santa Cruz Group by Mr. C. E. Kirk, of the San Christoval Estates Limited during the early part of this year. It was on the surface at a spot where a forge had been erected, fire clinkers and small pieces of lead being found in the neighbourhood. Moulded bullets were found with the shoe-buckle and spanners and the head of a tomahawk were picked up about four chains away, likewise other buckles, Spanish dollar pieces, and various odds and ends. The buckle, which probably belonged to a member of the La Perouse expedition, is composed of an alloy, which, when polished, shines like gold. The circumstances surrounding the disappearance of La Perouse with his ships and company have a special place in Australian history, and a brief account of his voyage may be of interest.

At the age of forty-four La Perouse had attained to the position of post captain in the French navy, and he was appointed by Louis XVI. to command an expedition, which had for its object the examination of the coasts of Asia, America and Australia. In charge of the frigates "Boussole" and

"Astrolabe," he set sail from Brest on August 1st, 1785. The ships' companies consisted of eighteen officers, seventeen scientists, and one hundred and fifty three men. They crossed the Atlantic, rounded Cape Horn, and sailed as far north as Alaska. From there they journeyed south, and crossed the Pacific to the Philippine Islands, whence they sailed along the coasts of China to Kamchatka.

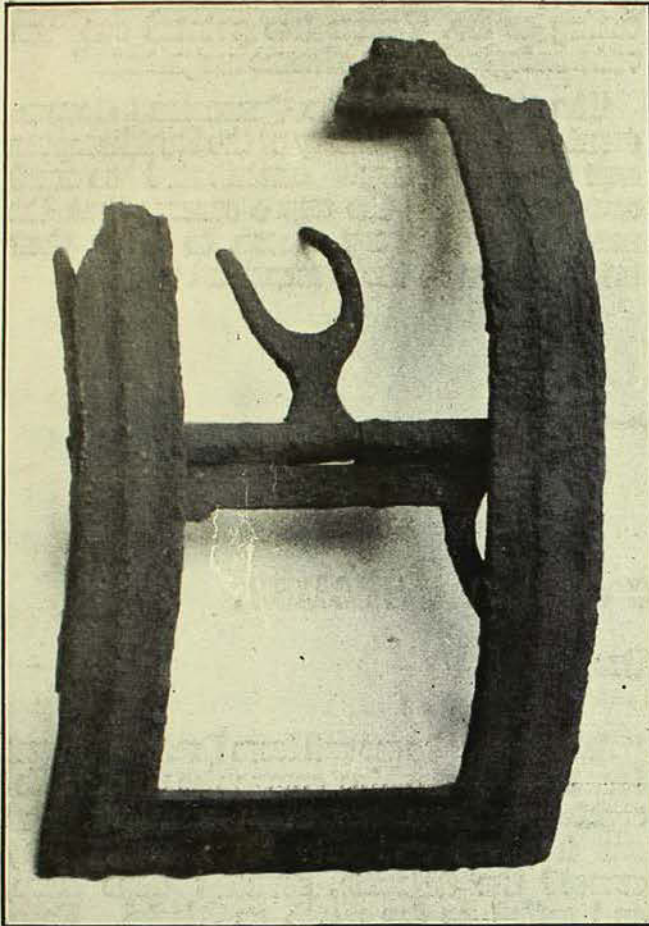
After a stay in these parts, La Perouse directed his vessels once more into the tropics, and stopped at the Friendly Islands, arriving there early in December, 1787.

While landing for water at Tutuila in this group, he was unexpectedly assailed by the natives in strong force. Before he and his compatriots could get clear, twelve of the party were killed, including Post Captain de Nangle, the second in command. In his journal La Perouse writes: "This event deprived us for the time of 32 men," indicating that twenty were also wounded.

This catastrophe was the immediate reason for visiting Botany Bay, where he intended to construct a new longboat to replace those abandoned at Tutuila. On January 24th,



1788, six days after the arrival of Governor Phillip's Fleet, he sailed into Botany Bay, where on February 17th one member of his scientific staff, Father Receveur, died and



Buckle which probably belonged to a member of La Perouse's expedition.

[Photo.—G. C. Clutton

was buried ashore. After several interchanges of courtesies between the officers of the French and British ships, La Perouse sailed away, and for nearly forty years no tidings of his fate were received.

In 1791, D'Entrecasteaux was despatched with two vessels, and, after a fruitless search and an absence of four and a half years, returned to France without their commanders, both having died at sea.

It remained for Captain Peter Dillon to discover accidentally the fate of the La Perouse expedition. In 1826, while in command of his own vessel, the "St. Patrick," he happened to call at the Island of Tucopia,

in the Santa Cruz Group. While there, his artificer traded some fish hooks to a lascar, and in exchange received a silver sword-guard which was unmistakably of French origin. On enquiry it was ascertained that this relic formed part of a number of articles from the neighbouring Island of Vanikoro, where years before two large ships had been wrecked during a violent storm, one sinking in deep water, while the other was driven ashore. He was also informed that portions of the wreck still remained, and there were two survivors on the island. In support of this story, ship's ironwork, axes, culinary utensils, etc., were produced all indicative of French workmanship.

The "St. Patrick" being in a leaky condition and short of provisions, Captain Dillon had to leave. On his arrival at Bengal he reported the discovery to the Indian Government, and offered his services to navigate a ship to the island. He was therefore placed in command of the East India Company's Survey Ship "Research," and sailed for Vanikoro on January 20th, 1827.

After gathering up all the relics he could find he proceeded to Calcutta where he was graciously entertained by the Governor General and the French Resident. The relics were eventually conveyed to France, and finally deposited in the Musée de Marine, Paris. For his services to the French nation Dillon was received by the King, Charles X., who created him Chevalier of the Legion of Honour, and bestowed on him an annuity of four thousand francs.

It was also ascertained that the survivors of the vessel which foundered were murdered by the natives as they landed, while many from the reef-wrecked vessel managed to get ashore. These survivors built a boat from the remains of the wreck, and as many as could conveniently be carried sailed away and were lost; the others died or were killed by the natives afterwards.

Such was the end of La Perouse and his gallant band, in memory of whom a portion of ground at La Perouse on the shores of Botany Bay, has been alienated as French soil.



## The Aborigines of Australia.

BY W. W. THORPE.

**B**RIEF articles on the aborigines have occasionally appeared in the AUSTRALIAN MUSEUM MAGAZINE, but it is thought that a general account of their origin and affinities, together with a brief description of some of their manners, customs, and beliefs, might be of interest to our readers.

The aborigines are a very ancient people, and have occupied this continent for thousands of years. Their exact position amongst the races of mankind is still a matter of conjecture. In some of their customs and physical characteristics they resemble the Andamanese and the Veddahs of Ceylon, but the latter are a bow-using people while our aborigines have no knowledge of this weapon. Regarding the shape of their heads, it has been said that on account of the multiplicity of primitive characters they are a people that could serve as a common ancestor for all the modern races. Their language, one of many dialects, is comparable in some respects with the Dravidians of Southern India and the non-Melanesians of Papua.

Their entrance into Australia from the north-west is generally supported both by the evidence of legends and similar physical characters observed amongst the tribes along definite lines of migration across the continent.

It is impossible to say with any degree of certainty how many aborigines there are in the Commonwealth to-day, but, including the Northern Territory, the number has been stated at over 62,000. At the first census of aborigines in New South Wales, taken in 1883, there were 7000, in 1921, the number stood at just under 1600, to-day there are less than 1000—a decline so rapid that, as far as this State is concerned, the end of the race is closely in sight. In Victoria the tragedy is more poignant for in 1924 there existed only 74. These figures exclude half-castes. In the early days of settlement the coast between Botany Bay and Broken Bay supported 1500, and within twenty-five miles of Sydney, the metropolitan area, 3000.

Throughout the continent the aborigines believe in beings possessing supernatural powers. These are the so-called gods of the

race and the all-fathers who instructed them in the arts of life and arranged their marriage customs. Their religious ideas like those of most primitive people are based on fear, and one of the main objects of life was to placate these invisible beings or forces. Though there is much to make one smile at some of their naive and childish beliefs, there is much to admire in many of their observances, which, when in practice, made for the general order of the community.

The children of an aboriginal household have a pleasant time, but this cannot be claimed for the mother. Married at an early age, and hardly ever to the man she would have chosen for herself, her lot is one of hardship and responsibility. Beside bearing and rearing children she is also expected to do all the heavy work for the family. She builds the bough-shelters, keeps the fire going and cooks most of the food. When shifting camp she is saddled with most of the portable property, in addition to often being encumbered with an infant. The newly born child is not born dark, but is somewhat fair in colour. The face is the first to darken, which hue gradually spreads over the body and limbs. The naming of the child is generally associated with some happening at the time. The call of a bird, the passing-by of an animal, or even the presence of an insect, will prompt a name. Later, during initiation ceremonies of manhood or womanhood the name will be changed. Training for bush life begins at an early age. For the boy, miniature weapons are made by his father or maternal uncle, and the girl is taught to so recognise food roots and berries, and to collect these things together with many other forms of vegetables and lowly animal life. If the camp is near plenty of water the children are taught to swim. The boy at an early age accompanies his father when hunting, and by this means acquires a considerable amount of bushcraft. At the camp the girl is taught the art of making string and nets, the grinding of seed and the building of shelters.

The aborigines are very kind to the old and infirm, and the children are treated with



great indulgence. When a death occurs it casts a gloom over the whole community and genuine grief is often expressed.

The attainment of maturity is a very important period in the life of the aboriginal male. It means that the time has arrived when the boy no longer looks to his mother, but he must enter into manhood by means of initiation. The ceremonies referred to as the Bora were general throughout Australia but have now been largely abandoned in the more settled parts. Although differing in detail according to locality, they all had for their object the inculcation of discipline, the rules of warfare, fortitude, and their conduct towards the female portion of the community. Often these ceremonies were combined affairs. A neighbouring people might also have boys ready for these rites and the elders would confer and initiate the lads at one and the same time. For the time being all feuds were forgotten and the full muster of adult males would concern themselves with the business in hand. These ceremonies often lasted for a long time, the presence of the women-folk being strictly forbidden. It is during initiation that a front tooth was knocked out and other surgical rites performed. During the progress of these rites it was customary to sound the "whirler," or "bullroarer," a tongue-shaped slab of wood at the end of a string. This was swung around by one of the men almost continuously. The roaring sound emitted made the ceremonies very impressive to the boys, who were severally informed that it was the voice of the god. Amongst some of the New South Wales tribes these initiation ceremonies were conducted within a circle of trees with carvings made on the bark of the trunks. Examples of tree-holes so decorated may be seen in the Museum.

Another form of ceremonial observance was the corroboree, a dance which usually took place at night. Sometimes this was of a semi-religious character connected with the food supply or it might be meaningless or pantomimic.

Girls were often betrothed at a very early age. If, as the girl grew into womanhood, her fancy led in another direction she might attempt to elope with the man of her choice—a happening sure to cause trouble in her parental circle besides displeasing the husband-to-be—but her family would be bound

to retrieve her to carry out the contract made on her behalf. In this case she would be beaten, but if she repeatedly ran away, they would probably let her remain, the chosen husband having the right to kill either or both of the offenders. These heroic measures must be interpreted in the light of aboriginal law, where the wife is regarded as personal property of her lord and master.

Courting is usually arranged through an intermediary, generally a relative who makes known to the party concerned that he or she finds favour in the eyes of the one who makes the first advance. Marriage was not allowed within the forbidden degrees of relationship, or if the young man had failed to pass through the man-making ceremonies.

Primitive people may be sharply divided into two classes—food producers and food gatherers. The aborigines of Australia belong to the latter class, a race who live by the products of the chase and follow the seasons for vegetable foods. Agriculture as we understand it, is entirely absent, if we exclude the replacing in the ground of the top after the removal of the tuber, as practised in parts of Western Australia. Fish are speared, netted or obtained by the aid of vegetable poisons. Foliage, bark, or roots of certain trees are thrown into the water causing the fish to sicken and rise to the surface when they were secured. This method was only applicable to bodies of water of a limited size where the infusion would be strong enough to affect the fish. The aborigines depended largely on their bushcraft in noiselessly tracking the game. The boomerang was used more for killing animals in the bush. Much of the food partaken of by those living on the coast was derived from the sea and its estuaries. The heaps of shells, or kitchen-middens, on the foreshores, or trailing down from the rock shelters, testify to the abundance of molluscs eaten by our aborigines. Some of the tribes cooked their food in earth ovens. A fire was made and a number of stones were heated. After the fire had subsided, green grass was spread upon a layer of these stones. Upon this was placed the carcass of the animal, then more grass, and stones again over all. Sometimes a little water was added and the joint left to cook. This method is practised in a more elaborate way by some of the South Sea peoples who cook in a hole dug in the ground.





Bottle and Glass Rocks, Port Jackson. When the tide is out long lines of rocks lie exposed in the bed of the channel and provide for the marine zoologist one of the richest collecting grounds in Australia.

[Photo.—A. Musgrave.]

## The Bottle and Glass Rocks, Port Jackson. A Marine Zoologist's Paradise.

BY FRANK A. MCNEILL AND ANTHONY MUSGRAVE.

LIKE a cromlech raised by Druids of old, there stands at the entrance to Parsley Bay in Port Jackson a picturesque pile known as the Bottle and Glass Rocks. The original bottle and glass conformation was long ago destroyed by an enterprising naval gunner who fortunately was provided with a less efficient weapon than those of to-day.

What now remains of the original pile is separated from the mainland by a narrow and shallow channel, the rocks assuming the character of an islet at high tide, and being sufficiently isolated to provide a retreat for numbers of gulls, terns, and cormorants, who avail themselves of its position as a fishing

post and for the command it affords of land and water.

The locality has long been the haunt of the marine zoologist, who finds it one of the richest collecting grounds in the Commonwealth, many species having been first made known to science from the spot. Being within a short distance of the headlands of the port, the islet is subjected to the swirl of a light surf, which pours silvery cascades of water over and among boulders thickly peopled with a myriad forms of marine life, bringing to them sustenance or perhaps death. Here in the wash of the surges these creatures lead a precarious existence with often no retreat to protect them from the death-





The crevices of the outer rocks in the surf zone are encrusted with the hard limy tubes which are the dwellings of vast numbers of Galeolarian worms.  
[Photo.—A. Musgrave.]

dealing devices of natural enemies. Sometimes they may be seen lurking timorously in the shelter of a weed-fringed crevice ever fearful of danger, like the seabirds on the wind-carved rocks above.

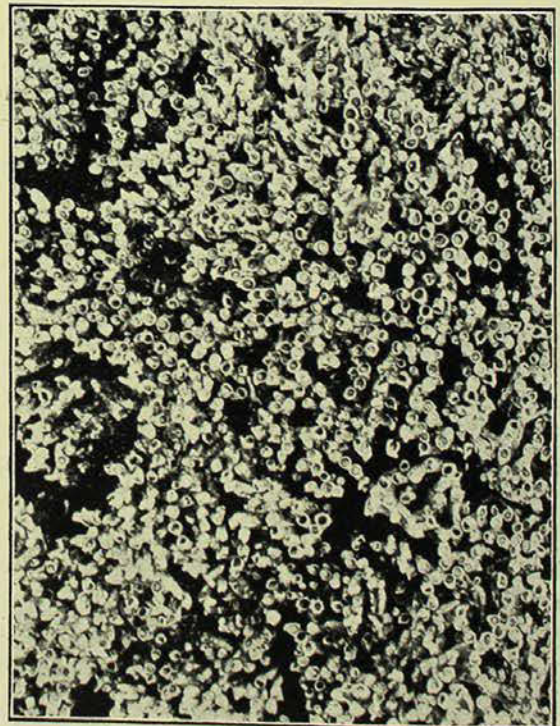
On the fall of the tide, long broken lines of rock become exposed in the channel, and in the pools left by the receding water a momentary peace reigns for the tiny sea-warriors in their life-long struggle for existence.

#### “ THE SYDNEY CORAL.”

On the outer rocks in the surf zone may be seen the huddled tenements of the Galeolarian tube-worm colonies, showing like bleached coral against the darker sandstone. In living examples every tube is inhabited by a tiny worm (*Galeolaria caespitosa*) which, when the tide is out, is contracted into its tube and the entrance closed by means of a hard, limy, hinged lid or operculum. If a submerged cluster of tubes be watched, however, there will be seen to protrude from the openings a number of finely branching structures known as gills or branchiae, which are waved to and fro in the water when their owner is feeding on drifting animalculae. The worms' dislike for mud

and sand causes them to associate in places where they are unlikely to meet with such irritants, and the piles of wharfs are commonly encrusted with their white tubes.

The rock crevices seem to be particularly favoured as building sites, and here the coral-like appearance of the tubes is even more pronounced. The worms seem to enjoy one another's society, for their homes are often cemented together to form a mass several inches in thickness. Walking bare-footed over these calcareous cities is a distinctly painful proceeding to a nature-loving Gulliver investigating the lives of these marine lilliputians. Each tube is strong and sharply ridged, the ridge extending as a tiny projection over the mouth of the tube.



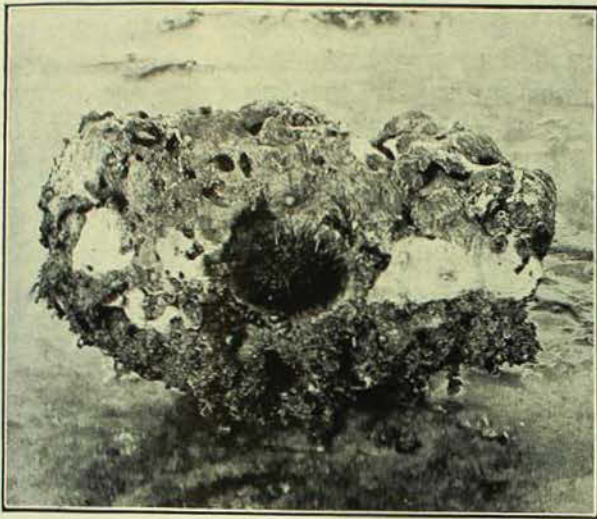
Detail of the exterior of a galeolarian colony showing the openings to the many tubes, numbers of which are sealed by lids or opercula.

[Photo.—A. Musgrave.]



## SEA-URCHINS.

Countless sea-urchins abound in the crevices and in every conceivable nook and cranny among the boulders. Some may be seen in earnest conflict with fast-growing Galeolarian colonies, which, on some irregular ledge, may all but imprison them. By the



In an overturned boulder is revealed a sea-urchin in a recess which its spines have excavated in the soft sandstone, while on each side of it are two shallow concavities showing as white areas and from which sea-urchins have been removed.

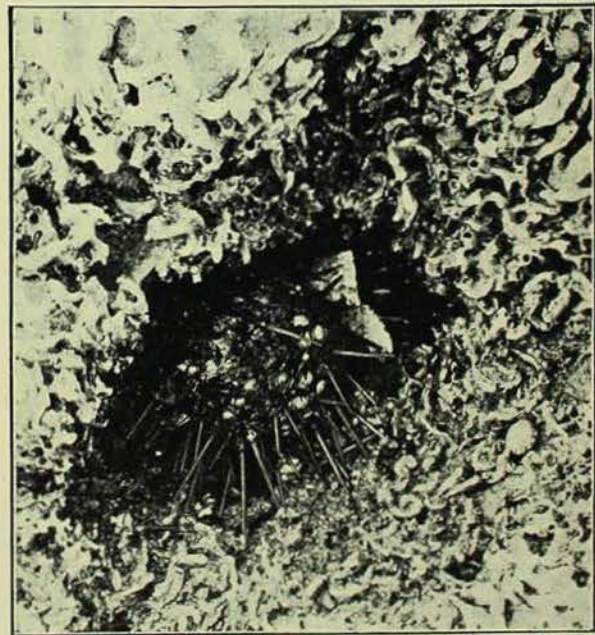
[Photo.—A. Musgrave.

constant movement of their hard spines they grind out a cavity for themselves, blocking its opening with pieces of seaweed and shell debris. Though provided with only a delicate internal structure, their external muscular organisation is very well developed. Around the bases of the spines, which are attached to the hard corona or test by ball and socket joints, are great bands of tough tissue. These maintain such wonderful control over the spines that any one section can be moved in unison, and they provide the creature's chief means of locomotion. Associated with the spines is a system of tube feet, the operation of which makes one marvel at the instinct of these so-called lowly forms of life. These "feet" are extruded through numerous openings in the test and take the form of delicate hollow cylinders of semi-transparent tissue provided with suckers at their extremities.

They are operated by a water-vascular system in the interior of the body, and the control of this liquid pressure can be con-

centrated at one or more points at the will of the sea-urchin. Two kinds of feet are present, one occurring most commonly among the short spines on the under-side of the urchin, the other on the upper side. The former take a purchase on the rocks when the spines are moving, and assist in the manipulation of food as it is being passed to the mouth in the middle of the under side. The other tube feet are the food gatherers and can be projected far beyond the extremities of the spines, enabling them to cling tenaciously to some unfortunate inhabitant of the inter-tidal zone. While groping in this manner for prey they gather up the flotsam and jetsam with which the upper surface of the sea-urchin is often garnished.

Sea-urchins will hide from sight whenever possible, and no doubt begin their early life under many of the loose boulders that occur between tide marks. If a boulder is overturned it may be found to protect two and often three individuals. These are often ensconced in cavities which they have excavated in the sandstone, and as growth progresses these recesses are enlarged by the constant movement of the spines. In softer rocks the wearing extremities of the spines are replaced fast enough to cope with the



A sea-urchin lurking in a rocky crevice and almost imprisoned by the incrusting tubes of a Galeolarian worm colony. Shell fragments may be seen among the spines on the upper surface of the animal, while others have been removed.

[Photo.—A. Musgrave.



surface against which they are ground, but it sometimes happens that an unlucky urchin selects a harder type of rock, and we find its activities have been considerably restricted. Here the spines are worn down to mere stumps, their rate of growth being insufficient to cope with the great task which the sea-urchin has imposed upon them. The very common variety met with in the locality is a purple coloured species technically known as *Heliocidaris erythrogramma*, which attains a diameter of about three inches and has smooth spines. A closely allied species, also purple in colour, is the larger *Centrostephanus rogersii*, in which the spines are armed with concentric rows of serrated ridges. Apart from these species others are occasionally met with, but these seem to be spasmodic visitants to the locality and are not discovered without careful search.

#### AN UPTURNED BOULDER.

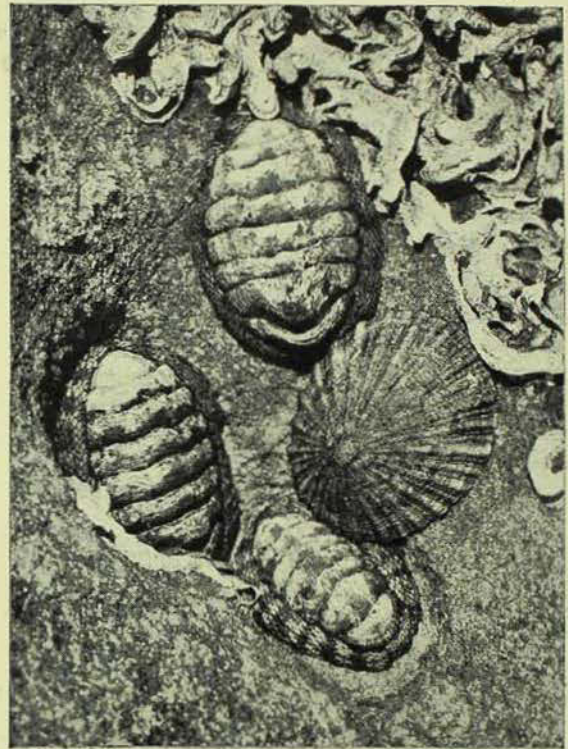
All those creatures without armature find sanctuary beneath the boulders, venturing forth only when the tide is full, so that a stone has but to be overturned and a wealth of small, but none the less interesting, forms will be revealed. Brightly hued soft-bodied sea-worms recover from the sudden transition from comparative darkness to the brilliant light of day, and crawl slowly over the wet surface of the rock like animated threads of scarlet. These are bristle-footed worms, so called because they possess a pair of tiny bundles of spicular bristles on each segment of their bodies, which serve as weapons of defence and organs of locomotion. In a measure, they compensate for the absence of an armour like that of their Galeolarian allies, and if they come in contact with the skin of a zealous collector they enter it and set up a severe irritation. In like manner they assist the worm against the attacks of predatory foes, their poisonous spicules proving effective weapons of defence.

Other conspicuous worms are the sluggish gourd-shaped gephyreans, yellowish in colour, which upon interference slowly withdraw their retractile proboscis with an action similar to the inverting of a glove finger. Unlike their bristle-footed relatives they are unsegmented, and bristles are absent from the body, which is protected only by a tough integument covered with chitinous papillae. These

latter enable the worms to excavate burrows and shallow channels in the decomposed under surfaces of the rocks.

#### LORICATES.

Loricates or chitons occur commonly among the rocks, and the conchologist knows the locality as one of the richest collecting grounds in the world for these animals. This peculiar fact is due to the unique situation of the spot, which is at the end of a channel or gutter leading from the deeper waters at the harbour entrance, so that it



Chitons (*Sypharochiton pellis-serpentis*) in company with limpets (*Cellana variegata*) and tubes of *Galeolaria*. They are everywhere to be found clustering together in small depressions on the rocks, from about the mid to the upper tidal zones.

[Photo.—A. Musgrave.]

constitutes the meeting place of the deep and shallow water forms. Thus it is possible to collect in the vicinity of the Bottle and Glass Rocks two-thirds of the known species of New South Wales loricates.

A good example of one of these quaint molluscs is furnished by a form technically known as *Sypharochiton pellis-serpentis*, which occurs abundantly in other parts of the harbour. It may be seen usually in some rocky depression firmly attached by its broad, flat, sucker-like foot. When viewed



from above, it is seen to possess eight overlapping pieces of hard, shelly armour, which extend transversely across the body of the animal. The outer edges pass under a tough greenish-coloured band of tiny scales which extend as a girdle around the body; from the resemblance of this girdle to the skin of a snake the animal has derived its specific name of *pellis-serpentis*. If the loricate be prised from the rock, the broad fleshy foot, which extends the length and breadth of the under-surface, will be seen. It is due to the suction of this foot that the animal is able to adhere so firmly to the rock and, like the limpets, to withstand the buffetings of the roughest surf.

The collecting of loricates is a fascinating pursuit, and is indulged in by many amateurs, who derive more healthy pleasure from their hobby than do those who prefer some solely indoor pastime. Equipped with pieces of flat stick, or glass and lengths of tape, they forage among the rocks above and below

tide marks in search of their quarry. These they carefully detach with the aid of a pocket-knife and bind flat with the tape on the wood or glass, afterwards removing the animal matter and mounting the shells afresh. Finally, when dry, they are neatly arranged in series on pieces of card and the data added alongside. Any one species of the more delicate kinds, which invariably occur in the darkest recesses on the under-sides of the boulders, range through a wonderful variety of colours, and for this reason have been utilised for mounting as dress-rings, brooches, and scarf-pins.

In a brief article such as this, it is possible to touch only on a few of the many interesting forms of marine life to be found in the locality, but if it be the means of attracting to the spot some nature lover, who prefers to study the habits of the animals rather than to collect and view their lustreless forms in some exhibition jar, then the purpose of this short notice is served.

Dr. T. Storie Dixon, on the eve of vacating the office of President which he has occupied for the past seven years, received the felicitations of the Board of Trustees. Dr. Dixon was elected a trustee in 1898, subsequently, upon his acceptance of the position of president of the Medical Board of New South Wales in 1918 he became an official trustee, and has given twenty-seven years of untiring service on behalf of the Museum.

Consequent on Dr. Dixon vacating the office of President of the Board of Trustees of this Museum Mr. Ernest Wunderlich, F.R.A.S., was elected President for 1926. Mr. Wunderlich, who has been a trustee since 1914, has always taken a keen interest in the Museum. Due to his generosity the Museum will shortly be able to place on view a fine aboriginal group, executed by Mr. Rayner Hoff. Mr. Wunderlich has travelled extensively, and has taken the opportunity to visit museums abroad.

The following standing committees of the Board of Trustees have been elected for 1926:

House :—Messrs. Jas. McKern (Chairman), F. A. Coghlan, E. C. Andrews, B.A., Dr. J. R. M. Robertson.

Finance and publicity :—Messrs. F. A. Coghlan (Chairman), Jas. McKern, O. C. Beale, R. H. Cambage.

Scientific and Publication :—Prof. L. Harrison (Chairman), Messrs. Dr. G. H. Abbott, J. J. Fletcher and Sir Charles Rosenthal.

During the past few months the Museum has been visited by a number of young immigrants, en route to Queensland. Opportunity was taken to give these lads lectures upon natural history matters likely to prove of interest to them in their agricultural pursuits and to endeavour to gain their interest in the protection of our fauna.



## The Red Whiskered Bulbul

### An Undesirable Importation.

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

THE bulbul, *Otocompsa emeria*<sup>1</sup> was first introduced to the readers of this MAGAZINE in July, 1922,<sup>2</sup> and subsequently brought under the notice of the general public a few weeks later through the agency of the metropolitan press.

It is an Indian bird with a distribution ranging from the Himalayas to Bengal, Assam, and Burma. It extends to China, Siam, and the Malay Archipelago, and has been introduced into the Nicobars, Mauritius, and Australia. It must not be confused with the Chinese Bulbul or any of the many other birds known as bulbuls in oriental countries.

It is about the size of a wagtail, and possesses a sharp, erect crest on top of the head. The forehead, crest, head, front of cheeks, and bill are black. A narrow black line extends from the corner of the mouth to the shoulder. The hinder parts of the cheeks and ear coverts are white, and there is a small tuft of crimson feathers immediately behind the eye. There is a narrow brown collar passing over the shoulders but it does not cross the chest, which is white. The abdomen is white, washed with brown. The wings and upper parts of the back and tail are brown, and the under tail coverts form a conspicuous crimson patch.

The nest is usually built in a shrub or low tree, and is cup shaped, composed of small twigs, leaves and grass. The eggs are usually three in number and are pinkish white marked with shades of red. The young do not develop the distinctive red tufts until about three months old.

#### IS IT FRIEND OR FOE ?

Before this question could be answered information and evidence had to be collected by investigation and public enquiry.

In answer to my verbal and published requests for information based on personal

<sup>1</sup>The Bulbul is known by many authors under the name *Otocompsa jocosus*.

<sup>2</sup>*Museum Magazine*, vol. 1, 5, 1922, pp. 152-154 *Id.*, 1, 7, 1922, p. 219.

observations, about fifty letters from interested persons were received, besides numbers of paragraphs which appeared in the press. Almost exactly half of these spoke in terms favourable to the bulbul, while a small



The red whiskered bulbul, *Otocompsa emeria*, an Indian bird accidentally introduced into Australia, and which has been proved to be a pest.

[Photo. J. R. Kinghorn.]

majority denounced it in terms which varied according to the extent of the damage done to their fruit or plants.

So many contradictory letters were received that the information they contained necessitated a very careful sifting. Some statements, such as: "I think the bulbul such



a cheery attractive little visitor that I would be sorry if he were to be looked upon as a pest," had to be discarded as useless from the point of view of economics, the writers being bird lovers looking only upon the aesthetic value, not thinking that even pretty birds can do a great deal of damage, and are therefore better out of the way. One correspondent writes, "From my observations I am inclined to think that insects are their main diet, but they like fruit as an extra." Another says, "I have seen bulbuls in the fruit trees actually eating the fruit, and have also observed them eating insects . . . He has a nasty habit of flopping into the trees and knocking the peaches off . . . I hope he will prove more useful than destructive, he is such an interesting, engaging little fellow. . . ." The two last letters show that, while the observers are bird lovers and hope that the bulbul will prove more of a friend than a foe, they have made faithful and valuable observations.

A.F. sums up, "On its first appearance I was very interested in the strange little bird and would not allow it to be disturbed, but now I am sorry that I did not destroy it as I consider it will become as destructive as the starling." "Bulbuls appear to be particularly fond of my mulberries and figs," is the opinion of another correspondent, who strikes the right chord when he adds . . . "it is a pity that these foreign birds are introduced here, because, whatever their habits may be in their native country, they seem to change them altogether, and from being useful to man, they become pests" —a statement containing a deal of sound truth. It is a calamity that any birds should be introduced into the country unless they have been certified as useful or, at least, harmless species. A.F.B. writes "fruit eaters they certainly are, but not destructively so, as they live on seeds and insects mostly." The term "seed eaters" cannot be strictly applied to bulbuls, though they eat many native berries and are particularly fond of ripe lantana berries.

One correspondent who answered all my questions at length ended with the following statements . . . "I have seen them strip thirty bunches of grapes, eat large holes in 100 apricots, 100 nectarines, 200 Elberta peaches, also mulberries and purple guavas. At present they are busy scooping the insides

of 40 figs. . . . I think they eat mistletoe, as this last two years a great number of mistletoe plants have germinated on all the fruit trees where they have rubbed the sticky seed off their beaks . . . this bird is not a song bird, all he says is: 'I will eat your figs! I will eat your figs! I will eat your figs!'"

My readers will see by this that there are some humorous tit-bits to brighten the path of serious research. The figures quoted suggest that there may be a great deal of unnecessary exaggeration in the statement, but the fact remains that the writer must have had considerable cause for complaint, and decided to give the bulbul a sound drubbing for the damage it did to his fruit. Had there been a flock of birds such damage might easily have been attributed to them, but, as only two pairs were mentioned, a considerable quantity of the fruit must have been eaten by starlings and sparrows.

As far as I can judge the interpretation of the call of the bulbul given by the last correspondent is an excellent one, though a friend of mine in this district, who drove a pair from his garden, declares that they sat in a tree and sang, "You're a dirty dog! You're a dirty dog!"

My friend, Mr. F. D. Blaxland, Hunter's Hill, who is an observer of exceptional ability, provided me with a very complete history relating to the introduction and subsequent spread of the bulbul throughout the metropolitan district, its earliest record in Australia being of a pair in 1905 or 1906 at Hunter's Hill, near Sydney, its original Australian home. Later it spread to the various suburbs, first north, then west and east, and although very numerous in the western suburbs, extending as far as Parramatta, it is still to be found in the greatest numbers in the districts surrounding the Lane Cove River. Mr. Blaxland sums up: "At first the new arrival appeared to be an acquisition, but longer observation has convinced me that he is likely to become a serious pest. While he certainly catches insects on the wing, his main diet seems to be fruit and berries, and while eating fruit of most kinds, he is the only bird I have yet noticed eating tomatoes (of which he is very fond), the seeds of the pepper tree, and (with the possible exception of an occasional starling) those of the camphor laurel."



According to many correspondents, as well as scientific record, the bulbul is particularly fond of the vine moth caterpillar, besides other insects such as hornets and wasps. This insect-eating habit would appear to be the only good point in its favour. In its home country, India, it apparently confines its activities mostly to useful deeds though occasionally it eats fruit. The fact is the insect supply in India is probably more than sufficient to keep it engaged, but in Mauritius, where it was introduced, it is changing its habits, and is attacking the fruit and driving away native birds.

My personal observations at first led me to believe that in Australia it confined its attention to insects, as I had seen several birds among ripe figs and plums carefully picking up insects and ignoring the fruit, but after many months of watching, I have come to the conclusion that it exhibits most of the bad habits attributed to it by numbers of my correspondents, and will eat, in addition to insects, figs, grapes, plums, guavas, the tips of green pea plants, petals of roses, etc.; in fact it is a versatile gourmand.<sup>3</sup>

An examination of the stomach contents of several birds failed to disclose insects, the food having been either fruits, greens, or native berries.

Before making a final decision I consulted with the members of the New South Wales section of the Royal Australian Ornith-

ologists' Union, and we concluded that the bulbul has many more bad points than good ones, it is an invader, and is here to the detriment of our own beautiful birds. A communication to this effect was sent to the Chief Secretary with the result that the Red Whiskered Bulbul, *Otocompsa emeria*, appears on the first schedule of the Birds and Animals Protection Act of 1918. This means that it is declared a pest and may be destroyed, but, as the whole of the eastern two-thirds of the County of Cumberland is a sanctuary under the Act, all birds except starlings, sparrows, crows, and a few others, are protected within this area. As the bulbul must be checked before it becomes the unmanageable pest that sparrows and starlings are, and as it occurs only in the metropolitan sanctuary, it was necessary to have its name added to the list of birds which may be destroyed within sanctuaries, thus allowing those persons whom it harms to destroy it without violating the Act.

Finally we may safely say that the bulbul, as an immigrant, is wholly undesirable, and, if allowed unlimited freedom and opportunities, would eventually have a ruinous effect on our fruit industries and an injurious influence on our own useful birds.

<sup>3</sup>This, and other food notes were given by Dr. John McPherson in *The Emu*, xxiii 1924, pp. 218-219.

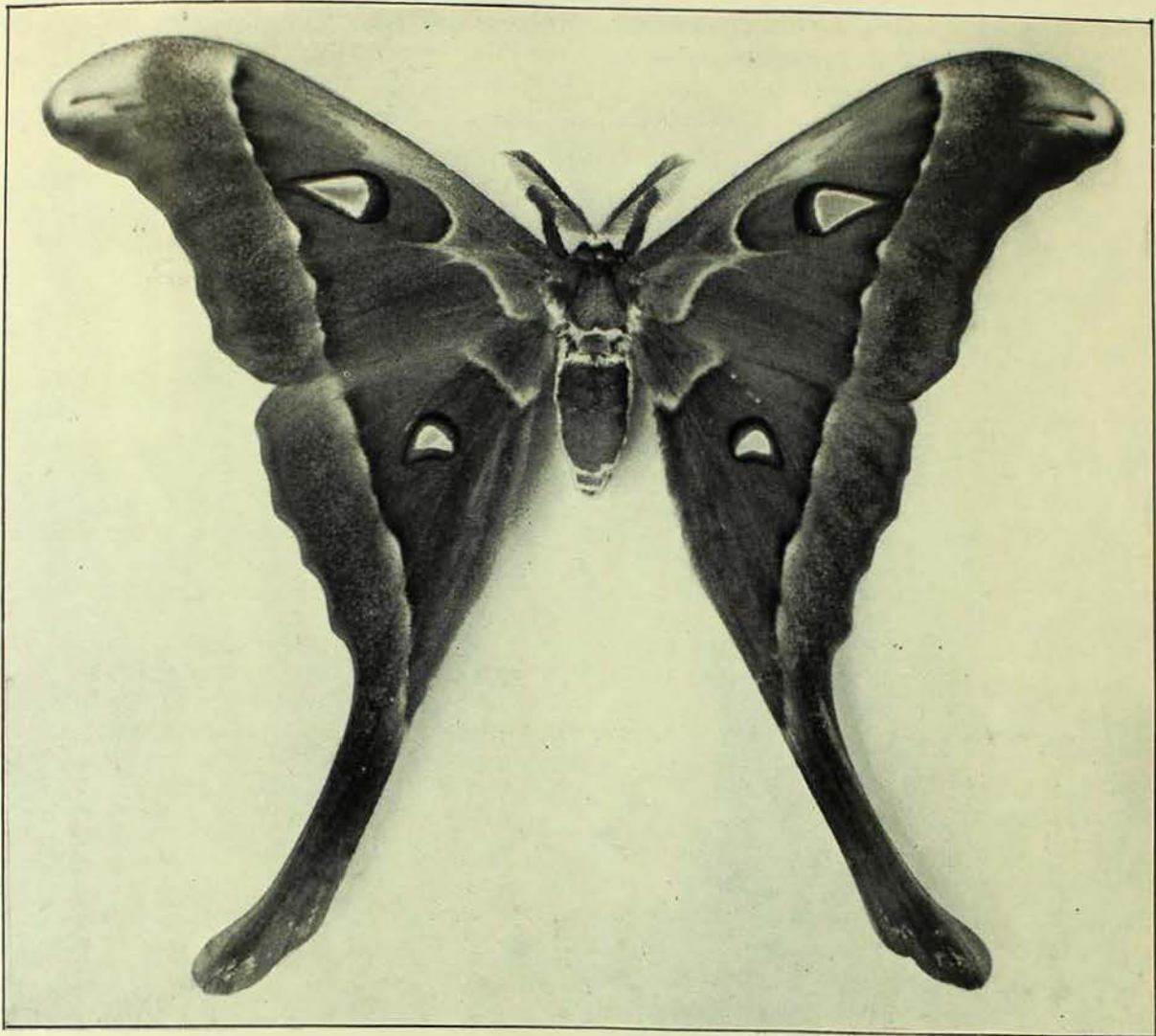
In our last issue reference was made to the generosity of Messrs. T. E. Rofe, O. Phillips, Sir Arthur Rickard, Sir Hugh Denison and Sir Samuel Hordern in defraying the expenses of casing the Ravi exhibit. This, we are pleased to say, has now been done and to these gentlemen thanks are due for enabling the Trustees to satisfactorily place on view such a fine exhibit.

Commander H. T. Bennett, R.A.N., of H.M.A.S. "Geranium," has further enriched our ethnological collection by the donation of a canoe from the Sir Edward Pellew Group, Gulf of Carpentaria. Thanks are due to this gentleman for so consistently remembering this institution during his surveying cruises on the Australian Coast.



## The Emperor Gum Moth and its Allies\*

BY THOMAS G. CAMPBELL.



Male of the Giant Australian Atlas Moth (*Coscinocera hercules*), a denizen of the north Queensland and Papuan scrubs. It measures nearly nine inches across the wings.

[Photo.—G. C. Clutton.]

**D**URING the spring and summer months there is perhaps no moth so frequently sent to this Museum for identification as the Emperor Gum Moth, *Antheraea eucalypti*. Nature lovers from all parts of the Sydney district bring in this beautiful moth and are eager to obtain information concerning it. The Genus *Antheraea* belongs to the Family Saturnidæ, in which are included the large moths of the genera *Attacus* and *Coscinocera*, which comprise some of the largest and most beautiful moths in the world.

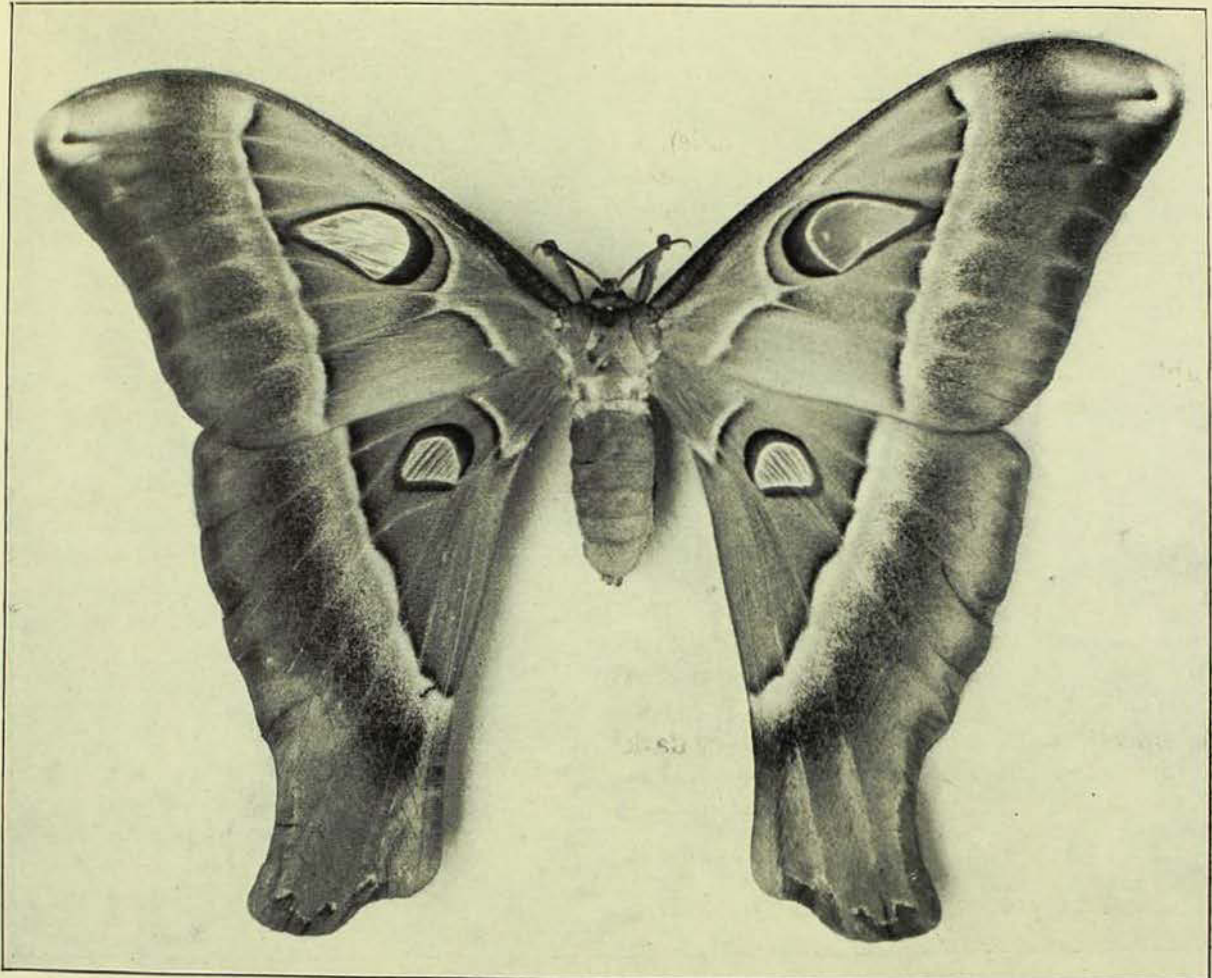
The Giant Atlas Moth, *Coscinocera hercules*, a denizen of the North Queensland and Papuan forests, enjoys the distinction of being the world's largest moth. The male and female of this species measure about  $8\frac{3}{4}$  and  $9\frac{1}{4}$  inches respectively across the outspread wings. The moths of the genus *Antheraea* may be distinguished from these allies by the absence of glassy eyespots in the wings; they have a very wide range, occurring in Africa, Madagascar, India, Ceylon, Assam, Java, and Australia. This genus

\* See Coloured Frontispiece.



also occurs in Japan where it is represented by the Japanese silk-worm moth, *Antheræa yama-mai*, a species which feeds only on oak leaves. This species yields a silk pale green in colour, and which was at one time reserved exclusively for the Japanese Royal Family. *Antheræa yama-mai* only produces one crop of silk each year, and it is being largely superseded by a Chinese species, *Antheræa perneyi*, which produces both a Spring and an Autumn

silk of these native forms with that of the silk-worm of commerce, *Bombyx mori*, it is found that the silk of the latter is far more suitable for manufacture, and can be had in regular quantities. Any increased demand for silk would probably mean the increased breeding of *Bombyx mori*, and the native silk-producing moths would not be exploited to any extent.<sup>1</sup> They can therefore offer no serious opposition to the true silk-worm



Female of the Giant Australian Atlas Moth (*Coscinocera hercules*). This is believed to be the world's largest moth, measuring over nine inches across the wings.

[Photo.—G. C. Clutton.]

crop. In India those moths which produce silk in their wild state, are all members of the Family Saturnidæ, but in many cases this silk is not produced in sufficient quantities as to be of any great commercial importance. Though the silk of some species of Saturnid moths has been found to be suitable for manufacture, garments made from it are said to irritate the skin of the wearer, as small spines and urticating hairs become woven amongst the silken strands. Comparing the

moth, *Bombyx mori*, as the silk of this species is far more favourable for manufacture and is always available.

Six species of *Antheræa* have been recorded from Australia, two occurring in the vicinity of Sydney, viz., *Antheræa helena* and

<sup>1</sup>A more detailed account of the Saturnid moths which produce silk and the methods by which the various species are cultivated is to be found in a "Manual of Entomology," by H. Maxwell Lefroy, M.A.



*Antheræa eucalypti* (The Emperor Gum Moth). The former has a range over Eastern Australia, and Tasmania, and also occurs in West Australia, while the latter is restricted to Eastern Australia and Tasmania. Of these *Antheræa eucalypti* differs from its ally by the presence of a small, whitish, triangular mark near the fore borders of the front pair of wings; this mark is absent in *Antheræa helena*.

In their native state the caterpillars of *Antheræa eucalypti*, as their specific name suggests, feed on the various species of Eucalypts, and they appear to favour the Blood Wood (*Eucalyptus corymbosa*).<sup>1</sup> The introduced Pepper Tree (*Schinus molle*), a South American native, has of late years been the food plant of this moth,<sup>2</sup> and many of the specimens forwarded to the Museum have been secured on this tree. The larvæ have been recorded as feeding on the leaves of apple trees also, causing considerable damage and necessitating the use of poison sprays to cope with their ravages.

#### THE CATERPILLAR.

The female of the Emperor Gum Moth lays her eggs upon these various food plants, the eggs being deposited in clusters of three or four. These eggs are creamy-white in colour, flattened at the sides and rounded at their tips. From these the tiny caterpillars emerge, and, though they are very dark in colour when first hatched, they change a good deal in appearance as they approach maturity. This is accomplished by a succession of moults, and, as the larvæ grow, after a time a complete transformation in colour can be observed, for the fully grown larvæ are a beautiful bright green. The larvæ of the Saturnid moths are of very striking appearance and that of the Emperor Gum Moth is no exception to this rule. The full grown larva measures about five inches in length, and each segment or division of the body is encircled with six, stout, red tubercles which stand erect and are tipped with blue; from each tubercle projects a radiating tuft of yellow spines. Towards the end of the abdomen there is a single tubercle, some-

what similar to the rest only yellow in colour and much larger. At the end of the abdomen is a pair of claspers, by means of which the caterpillar can attach itself to a twig of its food plant. Just above the legs there is a lateral stripe of pale greenish yellow, beginning near the head and traversing the full length of the body. The head is provided with red mandibles or jaws, and is shining brownish-green in colour. In the vicinity of Sydney during the month of December, these caterpillars can be secured in considerable numbers.

#### THE PUPA.

The fully grown caterpillars pupate during the same month, forming a somewhat oval cocoon, dark brown in colour and composed of a very tough fibrous material. This tough casing serves to protect the enclosed insect from the attacks of parasitic flies and wasps, and within this is a more delicate pupal skin surrounding the quiescent pupa.

Mr. A. H. Chisholm, who has observed the caterpillars spinning, states that the average time occupied in constructing the cocoon is about eight hours. The caterpillars appear to use the spined tubercles on their backs as darning needles with which to weave the strands of silk together, and not as structures for offence or defence. The members of the genus *Antheræa* have a somewhat remarkable way of making their exit from the pupal cases.

Many moths have pupa cases which are exceedingly delicate and are easily broken when the adult insect is ready to emerge. Other species, such as the Cup Moths, have lids at one end of the pupal case, which may be pushed off when the time is ripe, but to the pupæ of the Emperor Gum Moth, these conditions do not apply, though nature has here again made adequate provision for the future development of her beautiful offspring.

When about to emerge the imago or adult bursts the thin pupal skin enclosing it, and is then ready to commence its work of cutting an opening in the tough cocoon in which it is imprisoned. This task is accomplished in a very remarkable manner. Where the strong veins of the as yet tiny undeveloped wings converge at the base, is given off a pair of stout hook-like spines, and it is with these instruments that the imago is able to effect its escape. The insect first makes a series

<sup>1</sup>See Froggatt, Agric. Gaz., N.S.W., 1897, Vol. VIII, p. 253.

<sup>2</sup>See Musgrave *Australian Museum Magazine*, Vol. I., No. 7, p. 208.



of longitudinal scratches upon the inside of the cocoon at one end, and this reduces the inside surface of its prison to a tangled mass of fibres.<sup>3</sup> This method of attack serves a twofold purpose, for it weakens the wall of the casing, and affords a hold to the insect in its next operation, the cutting out of a circular opening in the cocoon wall. This the insect accomplishes by turning round and round within the cocoon, the movements of the wings thrusting the sharp, hook-like projections through the cocoon and severing the strands. This action is kept up for a considerable time, until there is a line of weakness developed in the cocoon, and the moth then brings pressure to bear on the weak spot. At first the circular portion of the cocoon yields only slightly, but by repeated cutting and thrusting on the part of the insect, an opening is eventually made. The sound made by the moth during this process has been likened to the gnawing of a rat. The time occupied in this cutting process is never less than two hours and may frequently be longer. When the insect has first emerged the hooks are completely hidden by the downy covering which develops at the base of the wings and thorax. These processes are universal in the members of the genus *Antheræa* and are present in the other members of the Family Saturnidæ, though some writers are of the opinion that the pupæ emit a fluid which has the effect of softening or causing the cocoon to rot in some way, thus allowing the insect to push its way out. Other writers, however, insist that it is by the use of the spines alone that the imago is able to make its exit.

#### THE ADULT.

The adult Emperor Gum Moth varies so greatly in colour that one must refer to the

<sup>3</sup>See Anderson, *Victorian Naturalist*, 1894, Vol. XI., No. 4, p. 69.

coloured frontispiece in order to gain an idea of the extent of variation. In both sexes the fore and hind wings are each crowned with a magnificent ocellus or eye spot, somewhat resembling those on the feathers of the peacock. The males vary in colour from light greenish-fawn to a reddish-brown. The fore wings have near their centres the ocelli, which are composed of a number of colours, brown-pink and light green or yellow predominating, and the tips of the forewings are usually light pink in colour. A light pink or brown line extends from the hind margin to near the tip of the wing, dividing it into darker and lighter portions. In the hind wings the ocelli are much more brightly coloured, orange and blue being the chief colours, while each ocellus is surrounded by a ring of black. Around the posterior margin of each hindwing is a band of yellowish hairs, and two dark lines similar to those in the fore wings divide each wing into three unequal parts. The female Emperor Gum Moth varies in colour from a pinkish-fawn to a light reddish-brown. In the forewings occur the ocelli, which differ but slightly from those in the male and a faint line divides the wing in the same manner. In the hind wings the ocelli compare in size and brilliancy with those of the male, though the brown lines dividing the wings are not always so well defined in the female.

The sexes may be distinguished from one another by their size and the shape of the wings and antennæ, the males being usually from 3½ to 5 inches across the outspread wings, the females from 4¼ to 5¼ inches. The female looks a heavier insect than the male, and the forewings are not scalloped as are those of the male, but are straighter. The antennæ of the males are broad and feathery, those of the females larger and more slender and fringed with shorter hairs.

On October 1st Dr. T. Storie Dixson delivered an address on "Captain James Cook, R.N., and the relics and mementoes associated with him in the Australian Museum."

The lecturer traced the life of Captain Cook, and his voyages in intimate detail. Many

incidents, not generally familiar, about the great explorer were made known, likewise details concerning the formation of the priceless collection of his relics and curios, possessed by this Museum. The lecture was illustrated by numerous exhibits from the collection, manuscripts, books, and lantern slides.



## The Deutsches Museum

BY ERNEST WUNDERLICH, F.R.A.S., PRESIDENT, AUSTRALIAN MUSEUM.

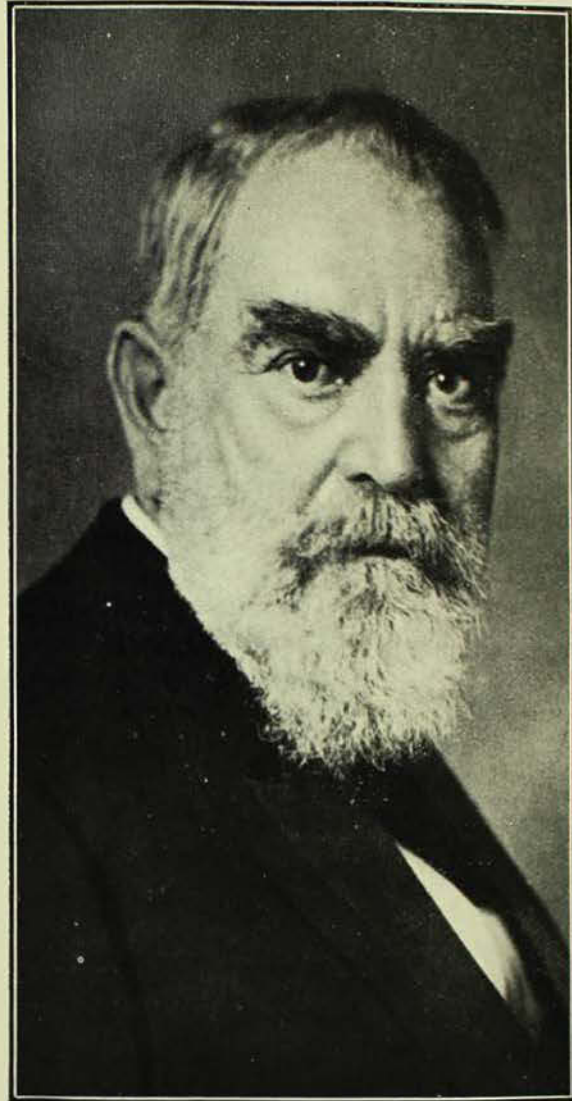
THE Deutsches Museum (German Museum) in Munich is perhaps the most important, certainly the largest institution of its kind. It is a technological, or science museum on a gigantic scale, covering the entire field of man's material constructive activity. Its underlying idea seems to be the evolution of the tool; the word taken in its widest sense as comprising every appliance and apparatus that from earliest times to the present day has served man in his long conquest over nature. It is a vast repository and workshop where his primitive mechanical beginnings are shown side by side with the marvellous machinery and instruments of modern times—it illustrates what is understood by Progress.

The enormous interest the Germans take in this museum, the great hold it has upon the people's mind, seem to point out the lines of the Fatherland's future development. These considerations give rise to the reflection whether the true index of a nation's civilisation lies not rather in the capacity of making a beautiful pot or a great poem than producing articles of utility. The city of Munich is a repository of art treasures but the Deutsches Museum has none. It does not even show applied art as in, say, the South Kensington Museum, London. The Deutsches Museum is a beacon to the German rising generation, indicating the material ideals in which it is to find salvation. As the name suggests, prominence is given to German achievements, and as one wanders through the 341 halls of this immense building one is reminded at every step of German supremacy in practical science.

The striking building, with its massive tower over 200 feet high, stands on an island, surrounded by the glacier waters of the rushing swirling Isar. It is approached by a noble bridge. The structure of the Museum is ferro-concrete, on piles of the same material. The roofs are of copper. The style is severe and dignified. Many of the building materials have been donated by well-wishers.

The Director and founder is Dr. Oscar von Miller, a benevolent autocrat; a man of

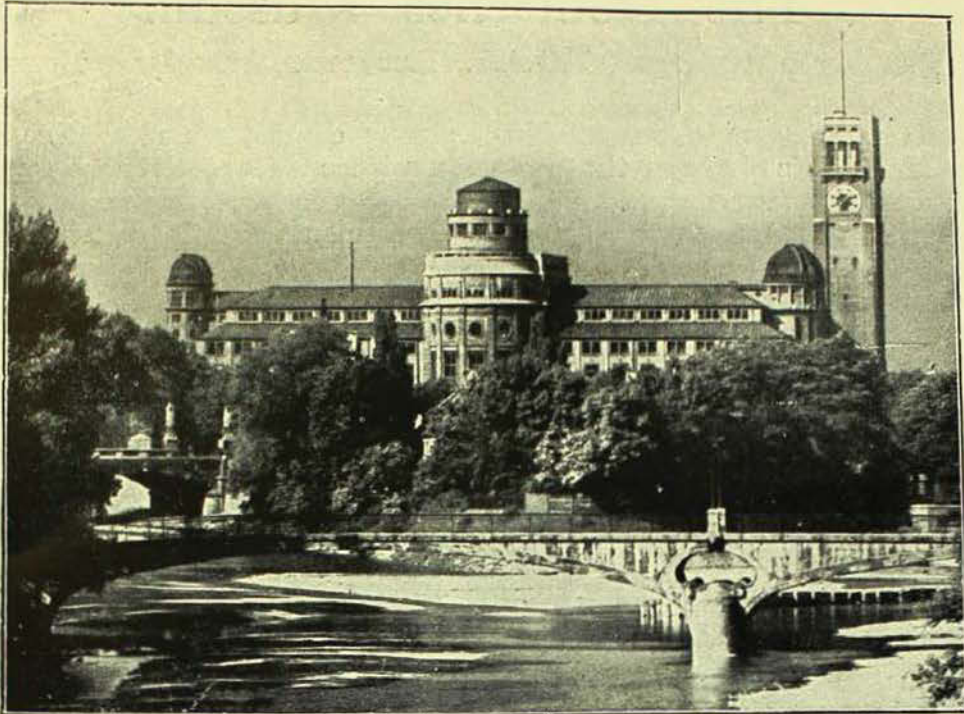
strong character and resolve, well versed in science. He received me very courteously and afforded me every facility to inspect the departments I was particularly interested



Dr. Oskar von Miller, the Director of the Deutsches Museum, who, more than any other man has been at the back of this museum.

in, viz., astronomy and the planetaria. With the limited time at my disposal I was able to have only a cursory glance at other exhibits. The building is so vast that a proper inspection would take weeks. Just to wander through would mean a walk of nine and a half miles, a task quite beyond me.





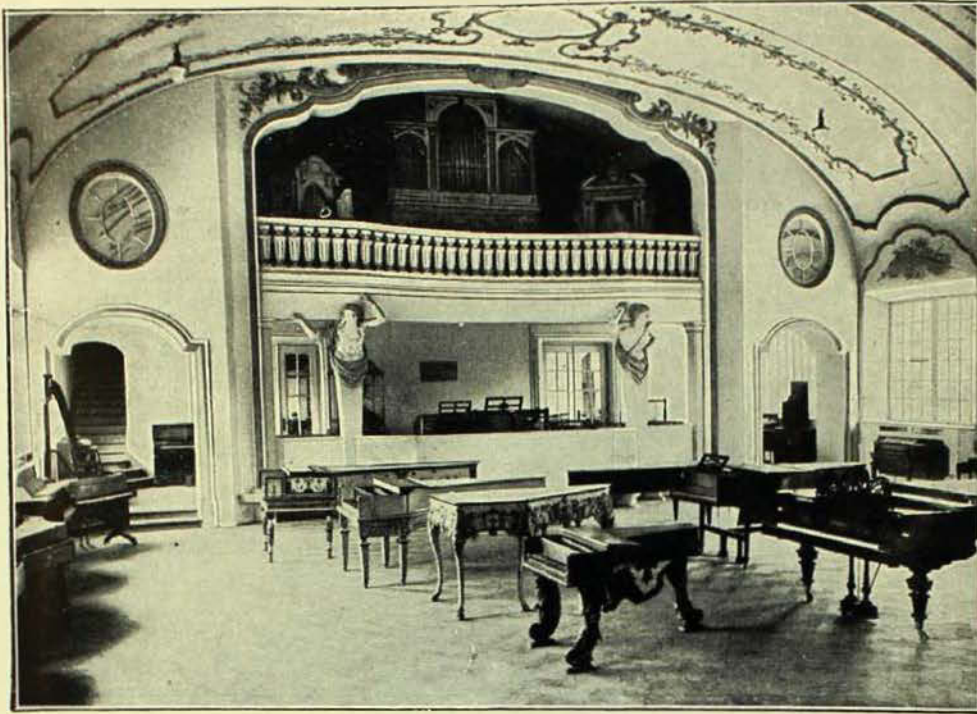
The Deutsches Museum, Munich. The building was designed by Gabriel and Emanuel von Seidl, and, after their death, completed by Prof. O. Bieber. The foundation stone was laid in 1906, and though building operations were suspended from 1915 to 1922, it was completed in 1925.

[Photo.—Rolf Kellner, Karlsruhe.]



The Restaurant





The Music Hall.

## STRIKING FEATURES.

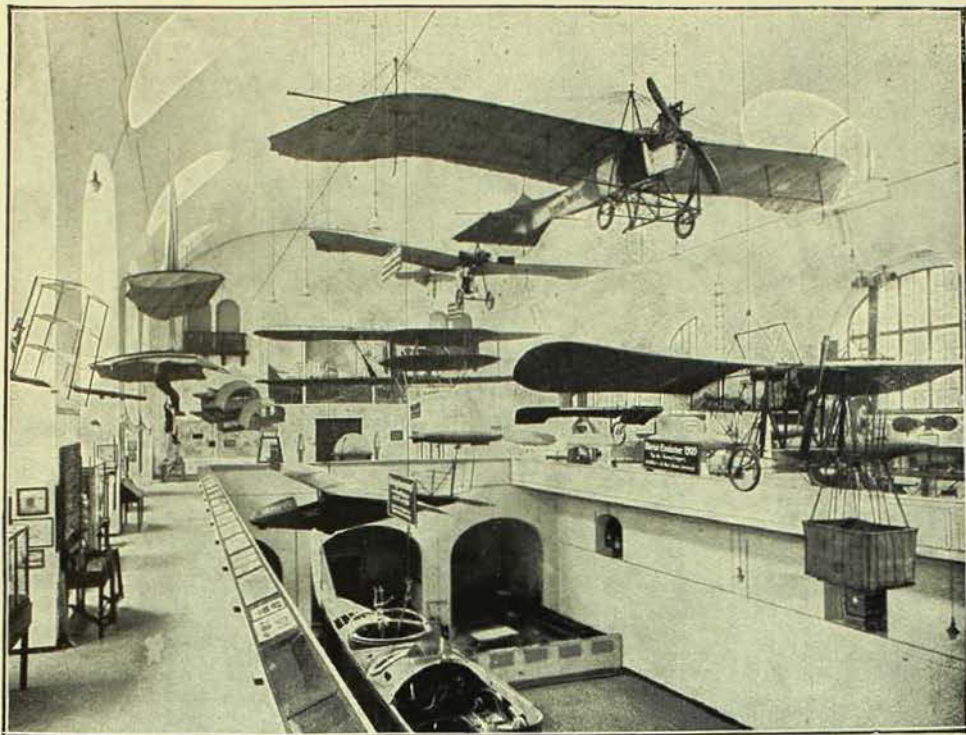
There is a large staff of educated attendants trained in the demonstration of exhibits in their departments. As an instance of the thoroughness prevailing I might mention that on my entering the lofty and spacious hall devoted to musical instruments, a musician-attendant was just playing Bach's G minor Prelude and Fugue on the grand organ, and at the same time explaining the mechanism of the instrument, which was open in front and sides showing the working of the swell, etc. In optics the attendants are mostly men trained at Zeiss or other works; astronomers explain the planetaria and the instruments in the observatories; a geologist interprets the models showing the strata of the earth's crust, and so on.

Ample cloakroom and lavatory accommodation are on each landing. The absence, or inadequacy, of these in most museums is the rule. The floors are soft and springy to walk on and are covered with linoleum throughout. There are seats everywhere for rest or observation. The circuit is

arranged on the basis of one way traffic; every room is numbered, and indicators point the way to the various sections. There is a fine public reading room, with comfortable accommodation. Here over 500 international, technical, and scientific periodicals are available. The library has 94,000 volumes, besides 8,000 autograph designs and sketches by great scientists, and a like number of engineering and building plans, graphs, etc., all available to students. An ingenious indexing system allows of any work required being produced very quickly. There is a restaurant where 350 people can be served at one time. This has been found too small, and a second and larger one is now being added.

The outstanding feature is the permission given visitors to set in motion the various exhibits, old and new, by pressing a button, turning a switch, or drawing a pin. That is why the Deutsches Museum exercises such a fascination over old and young. On my asking Dr. von Miller whether a lot of damage was done, especially by children, he replied





A view of the Aviation Hall. Lawrence Hargrave's models are on display here.

that the annual bill for repairs under this head amounted to 40-50,000 marks (£2,000-2,500), a sum, that, in relation to the millions of people who visited the Museum he considered negligible. He trusts his public implicitly and his confidence seems to be justified, for I have never seen anything but the greatest decorum and respect for the exhibits prevail. Hooliganism is unknown here, whatever it may sometimes be outside.

Guide books, full and abridged, are sold at nominal rates and are a great help.

#### EXHIBITION ROOMS.

The Museum is entered through the great Hall of Fame, containing effigies in bronze and marble and paintings of German men of science and industry. The ground floor and basement comprise 140 rooms. Underground are model coal, salt, and other mines, complete with their workings and appliances, men, horses, trucks, lifts, etc., all of which can be set in motion. These mines are the delight of boys. Here is all the heavy machinery relating to metallurgy, etc., also

geology, with models of strata, seismology, and dioramas showing prehistoric epochs with fauna, flora and man. Other sections on these floors are land transport, roads, railways, tunnels, bridges, hydraulics, waterways, harbours, shipbuilding, and navigation. Another instance of thoroughness is seen in section "Roads," the evolution of which is illustrated by models of Roman roads and streets and sections of main thoroughfares of a modern city.

On the first floor are eighty rooms. The hall devoted to aviation extends through two floors, and is lofty enough to allow of many types of flying machines being suspended. Here may be seen the original models of Lawrence Hargrave, a great Australian who was not appreciated in his own country. Any one seeing these epoch-making exhibits of Australia's genius housed in a German museum must feel a sense of shame and regret that we allowed outsiders to acquire them. On this floor are the multitudinous exhibits relating to physics, mathematics, the measurement of time and space, weights, mechanics of solids, liquids and





The Laboratory of an Alchemist.

gases, radiation, calories and artificial cold, laws of energy, chemistry, electricity, magnetism, telegraphy, telephony, wireless, optics, acoustics, music, etc. In every one of these sections are intelligent attendants to answer questions or explain apparatus. All exhibits are highly attractive and educational. In optics, for instance, the child who has seen the large movable model of the human eye, and has had its normal functions together with the correction of defects explained, is more likely to understand the laws of optics than one who has learnt merely from textbooks and diagrams. Knowledge acquired by an exact mental picture can never be effaced. The beginnings of chemistry are shown by authentic facsimiles of alchemist's dens, with their quaint paraphernalia; the series goes on with laboratories of the 17th, 18th and 19th centuries, up to that of the present day. In clockmaking the series begins with clepsydrae of the ancients and finishes with the modern chronometer. Spectacle making is made attractive by shops of mediaeval tradesmen; musical instruments show types from 3000 B.C. to the concert grand piano of to-day. Moreover any one

is allowed to try and play these instruments if he be curious, for in the Deutsches Museum there are no "verbotens." It is the one and only place in the Fatherland I know of where "everything is permitted."

On the second floor fifty-four rooms contain habitations, building materials, plumbing, sanitation, heating, ventilation, gas, lighting, etc. The reading room is on this floor. On the third floor sixty-six rooms are devoted to general industries. Much space is taken up by printing and agriculture. Astronomy and geodesy extend to the roof. Here are three domed observatories with full equipment, also a terrace with terrestrial telescopes for looking at the city and environs, and the great attractions, the two planetaria. To describe these adequately would involve an article in itself; a bare outline of each is all that I can give to-day.

#### PLANETARIA.

The Copernican planetarium is a mechanical apparatus electrically driven, contained in a circular room about fifty feet in diameter.





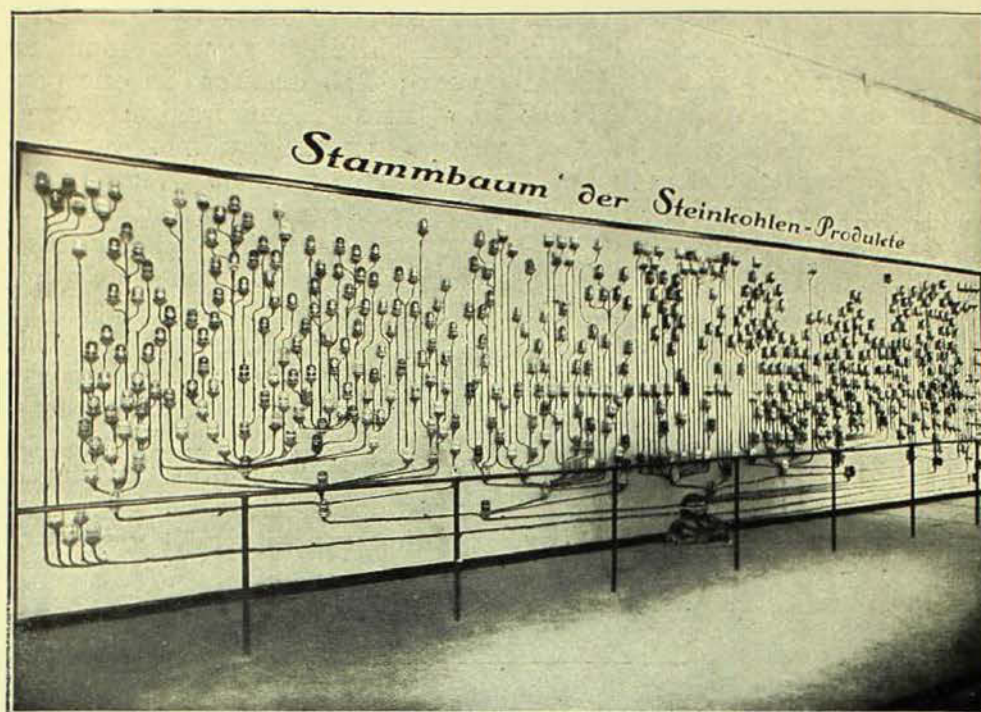
A model field showing the evolution of the plough from the primitive branch to the fine machines in use today.

The sun, a globe of subdued light, is in the centre, and the principal planets, turning on their axes, with their satellites circling round them, revolve around the central luminary in their respective orbits. The planets are represented by white globes of different sizes. Under the two representing the earth and the moon is a moving platform on which the spectator can accomplish the earth's annual orbit round the sun in four minutes. By looking through a periscope the retarding and advancing paths of the planets, their phases, and the apparent passage of the sun through the zodiacal constellations (shown by luminous points on the surrounding wall), can be observed. The changes of the seasons, the sequence of day and night, the phases of the moon are all phenomena this mechanism well illustrates.

The Ptolemaic planetarium, on the other hand, is an optical apparatus electrically driven, contained in a completely darkened domed rotunda. Here, not the sun, but the earth is in the centre. The spectators sit in the dome, on the inner surface of which a multiple projector of great candle power

throws the images of all celestial bodies as the naked eye would see them. After a little time the eyes become used to the darkness, and one has the illusion of being outdoors, with the starry sky overhead. Here the day, not the year, can be condensed into a few minutes. The sun (subdued), the moon, the planets, and stars (excepting the circumpolar ones), are seen to rise in the east and set in the west. The swing of the sun across the elliptic, its passage through the constellations, the loop like paths of the planets, the phases of the moon, and many other celestial phenomena can be readily grasped. The lecturer projects a luminous arrow to any object required and the names of the constellations can also be projected on the artificial sky in letters of light. The phenomenon of the procession of the equinoxes is shown; thus it is possible to set the apparatus so as to show the appearance of the heavens on any date. It can show how they looked on a date 10,000 years ago, and how they will look on a date 10,000 years hence. We can not only see the sky of the Pharaohs of Egypt, or the Star of Bethlehem





"Tree" showing the ramifications of coal and its various by-products.

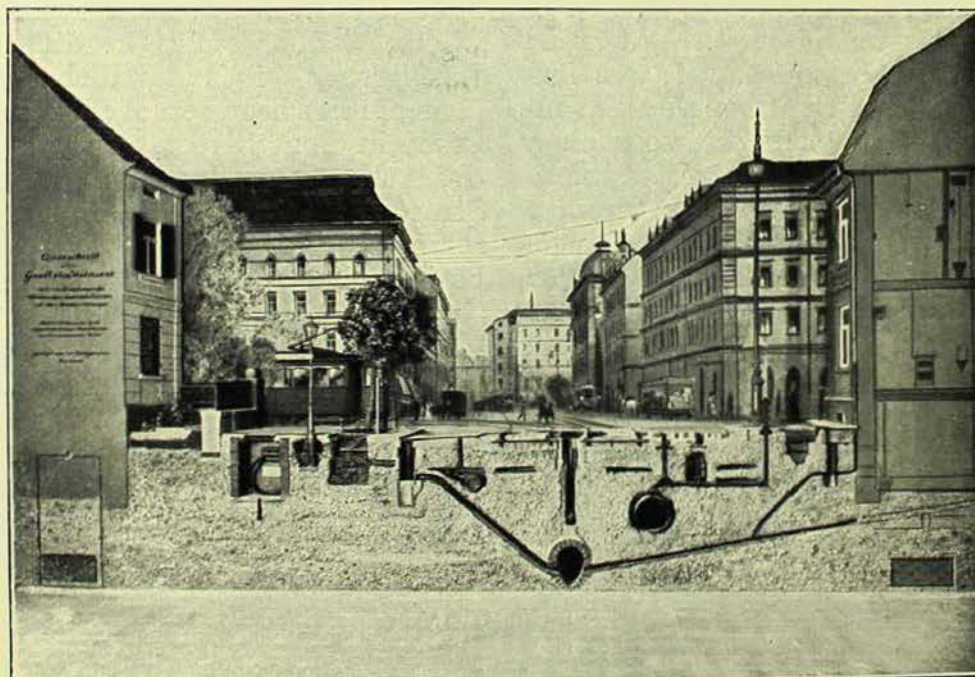


Exhibit showing a section of a city street. The "undergrounding" of the different services is clearly displayed.



at the birth of Christ, but the firmament as it will look in a few thousand years, when the North Polar Star, owing to precession, will have moved away from the celestial pole. These planetaria are of such great educational value that ten cities of Germany are installing them.

Finally on the tower is the section meteorology. The hands of the four dials, instead of showing the time, show, at a great distance, the barometric pressure, temperature, moisture and wind. And in the grounds are exhibits requiring a great deal of space, such as wind and sun motors, railway signalling and points, masts, semaphores, etc.

#### CONSTITUTION.

One word more as to the constitution of the Deutsches Museum. Besides enjoying

government subsidy, it is supported (like the American Museum of Natural History in New York) by public contributions. Ten shillings secures membership for one year; £10 or more in one payment entitles to Life Membership; corporations can become members for 25 years on payment of not less than £20. Very large contributions give the donors a seat on the Board. The entrance is not free; the fee is 50 pfennig (sixpence) during the day and 25 pfennig (threepence) after 5 p.m.; children half rates. Yearly, quarterly, or monthly tickets are issued at much reduced rates to schools or societies. Owing to a very large membership the finances of the Deutsches Museum are strong, and it does not suffer, as we do continually, from lack of government and public support.

## An Historical Fragment

Some few years ago when the late Robert Etheridge, Junr., then Director of this Museum was delving into the early history of this institution,<sup>1</sup> and the various homes it had in its infancy, he traced it to the "Old Post Office,"—this was in 1830. But as to which Old Post Office was meant it was impossible to say definitely, for there were no less than three offices answering to such a description—one in George Street about where the Metropolitan Fire Brigade, Circular Quay Station, is to-day, another on King's Wharf, opposite the Paragon Hotel, Circular Quay, and the third in Bent Street, at the rear of the Education Department's building. Evidence generally pointed to this last, and though it was not conclusively proved, it was accepted with a degree of certainty.

Mr. J. J. Fletcher, M.A., B.Sc., a Trustee of

this Museum, and who for many years has taken an interest in all matters pertaining to the development of our scientific institutions, recently presented a copy of the Sydney Herald Vol. I, No. 32, November 21, 1831, where, under the heading "Domestic Intelligence" it is stated that "The Sydney Museum has been removed from the old Post Office in Bent Street, to the spacious rooms over the Council Chamber, in Macquarie Street"—an item of information clearly removing any uncertainty upon this point, besides confirming the date of actual removal to the Legislative Council Chambers which was also in doubt.

<sup>1</sup>See *Records of the Australian Museum*, vol. xi., No. 4, 1916, p. 67. *Ibid.*, vol. xii., No. 12, 1919, p. 339