

*The*  
AUSTRALIAN  
MUSEUM  
MAGAZINE

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



- A Tomako, or Head-hunter's Canoe,  
from the Solomon Islands - *William W. Thorpe*  
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# THE AUSTRALIAN MUSEUM

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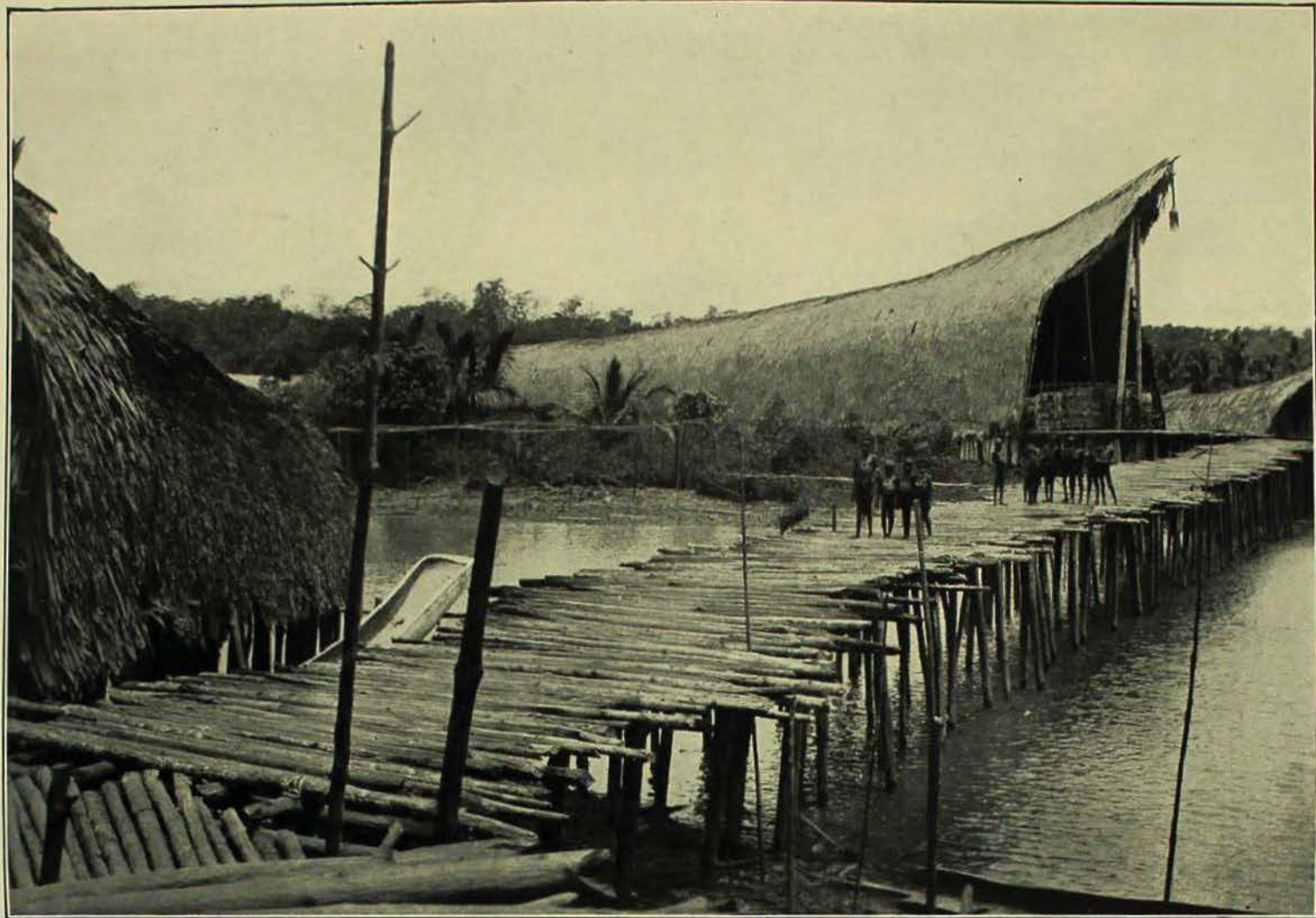
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THE GREAT RAVI OF KAIMARI, GULF OF PAPUA.

The entire village is elevated upon platforms built over a huge mud-flat and stick bridge-ways connect the many houses. The family dwellings are of comparatively small size, but the men's club-houses, or ravis, are huge buildings, some hundreds of feet long, and occasionally rise to a height of sixty feet at the entrance.

[Photo.—*Captain Frank Hurley,*



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VOL. I., No. 10.

OCTOBER, 1923.

## Editorial.

AN event of more than usual importance to Australian museums was the recent meeting in Melbourne of representatives appointed by the various State Museums and Universities to discuss matters of common interest. This conference was partly the outcome of a suggestion made by our President, Dr. T. Storie Dixon, who, in an address before the Board of Governors of the Public Library, Museum, and Art Gallery of South Australia, urged that a fuller measure of co-operation between the various Australian museums would be to the advantage of all. The authorities of the South Australian Museum thereupon proposed that a conference should be held to discuss the matter. Later the scope of the conference was extended so as to include such questions as the conservation of our indigenous animals, the issue of permits to collectors, the disposal of type specimens, and cognate matters.

The conference met on August 17th, concurrently with the Melbourne session of the Pan-Pacific Science Congress, and passed the following resolutions for transmission to the Federal and State Governments.

1. That this conference expresses its gratification at the action of the Commonwealth Government in appointing Advisory Committees in each State to

assist the Customs Department in connection with permits to take protected animals.

2. That it be a recommendation to the State Governments that they appoint similar committees.

3. That in all cases where specimens are exported the exporter be required to produce the State authority for collecting such specimens, and no person be allowed to export more than the number of specimens shown on the collecting permit. Three days' notice to be given of intention to export, in order to permit of proper inspection.

4. That in all States a gun license be imposed, and a royalty placed on skins obtained for commercial purposes, revenue derived from these two sources to be available for defraying the cost of administering the Animals Protection Acts and the conservation of the indigenous fauna.

5. That overseas collectors be required to furnish types or paratypes of new species and duplicates of rare species obtained in the Commonwealth and its territories to an Australian museum, preferably of the State in which the collections are made, and that local collectors should, as far as possible, make provision for the retention of types and rare species in Australia.

6. That the desirability of establishing additional faunal sanctuaries be strongly urged upon the Federal and State Governments, and that such sanctuaries be selected with a view to ecological requirements.

7. That this conference urge upon the Government of Western Australia the desirability of establishing a sanctuary, or sanctuaries, in a suitable area in the south-western portion of the State, for the preservation of the peculiar fauna and flora of that region.

8. That as far as practicable, there should be co-operation between the

various museums and universities, so that overlapping and waste of material be avoided.

9. That this conference urge upon the Australian National Research Council the necessity for alleviation of the present onerous conditions governing postage on scientific works and periodicals.

10. That this conference affirm the value of meetings of this nature, and suggest that arrangements be made for continuance upon some suitable permanent basis.

## Notes and News.

By the death of His Excellency Sir Walter Davidson, K.C.M.G., this State has lost one of the most popular and democratic Governors that it has been its fortune to have. His universality was notable, and all educational matters appealed to him. He took considerable interest in the Museum and its exhibits, and on more than one occasion he presided at lectures held in our lecture theatre.

Colonel Sir James Burns, K.C.M.G., M.L.C., who had been a Trustee of the Australian Museum since 1911 died on September 22nd after a long illness. He was one of the best known and most respected men in the commercial and business life of the Commonwealth, and his public spirit and benevolence found expressions in many directions. Probably the finest monument to his memory are the Burnside Homes for Orphans, which he founded and supported so liberally, but this was only one of the many worthy objects of his philanthropy.

Sir James took great interest in scientific matters and was a highly

esteemed member of the Board of Trustees. When funds were required for an expedition to Lord Howe Island he was one of the first to make a donation. He was interested in the subject of ethnology, and had accumulated a valuable collection of objects from the South Seas and the mainland of Australia, which are tastefully displayed in his beautiful home, "Gowan Brae," near Parramatta.

The name of Sir James Burns will long be honoured throughout Australia as that of a great citizen and leader, a highly respected business man, and a practical philanthropist.

On September 7th Sir William Vicars was elected a member of the Board of Trustees, to fill the vacancy caused by the death of Mr. George McRae. The new Trustee is well known as a leading manufacturer, and public spirited citizen. He was the chairman of the State Repatriation Board, 1919-1920, and President of the New South Wales Chamber of Manufacturers, 1900 and 1914. Sir William was knighted in January, 1922.

## A Tomako, or Head-Hunters' Canoe, from the Solomon Islands.

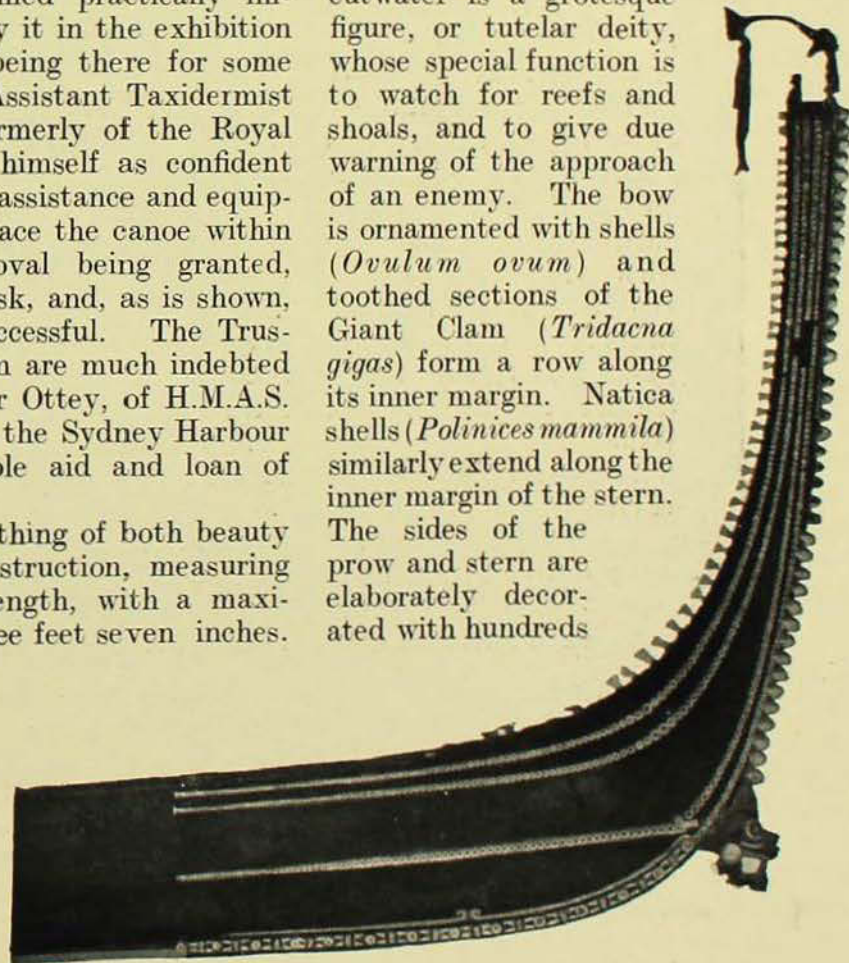
BY WILLIAM W. THORPE.

A FEW years ago the Trustees received from Mr. Harry Wickham, of Hobu Peka, Roviana (Rubi-ana), Solomon Islands, a large and beautiful example of a "tomako" or head-hunting canoe. It is a choice specimen of the craftsmanship of savage man, and though made especially for Mr. Wickham, is true to type, and was looked upon by the dusky inhabitants of the Roviana lagoon with as much pride as we regard a modern battleship.

It was greatly to our regret that, owing to its size and unwieldiness, it had to be placed on its even keel in a store, for it seemed practically impossible to display it in the exhibition galleries. After being there for some time, however, Assistant Taxidermist J. H. Wright, formerly of the Royal Navy, expressed himself as confident that, with proper assistance and equipment, he could place the canoe within the halls. Approval being granted, he essayed the task, and, as is shown, was eminently successful. The Trustees of the Museum are much indebted to Warrant-Officer Ottey, of H.M.A.S. *Melbourne*, and to the Sydney Harbour Trust, for valuable aid and loan of tackle.

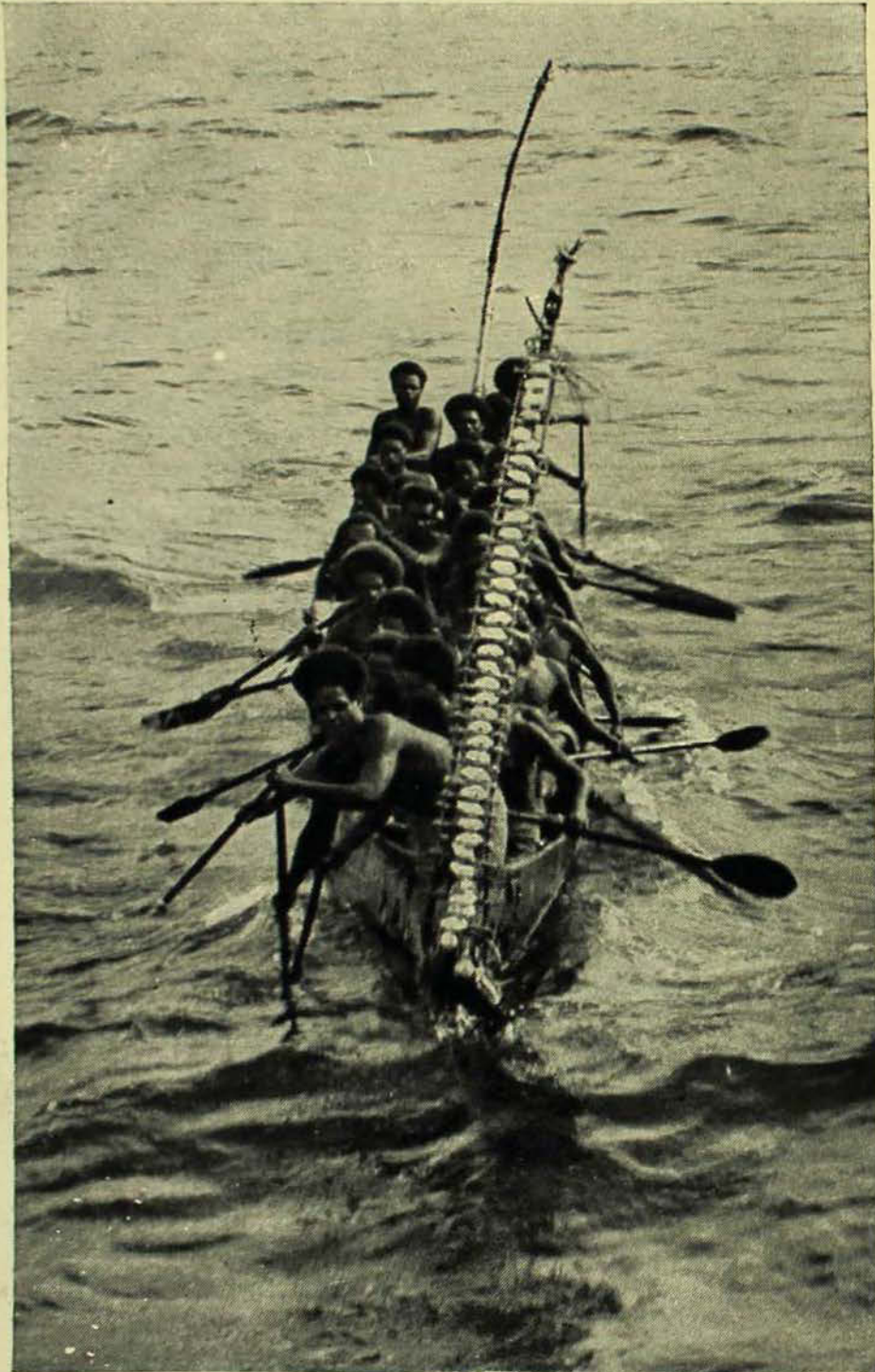
The canoe is a thing of both beauty and intricate construction, measuring forty-six feet in length, with a maximum beam of three feet seven inches.

Others are recorded ranging from sixty feet long and having a beam of four or five feet. The prow and stern are gracefully curved, the former rising to an elevation of nine feet six inches, while the stern is about eighteen inches higher; the effect of these is to produce what seems to be an elongated crescent. They are purposely high to protect the crew against arrows and other missiles when advancing or retreating. Diminutive carvings representing human figures and feather plumes surmount the prow and stern, while attached to the cutwater is a grotesque figure, or tutelary deity, whose special function is to watch for reefs and shoals, and to give due warning of the approach of an enemy. The bow is ornamented with shells (*Ovulum ovum*) and toothed sections of the Giant Clam (*Tridacna gigas*) form a row along its inner margin. *Natica* shells (*Polinices mammila*) similarly extend along the inner margin of the stern. The sides of the prow and stern are elaborately decorated with hundreds



The prow of the canoe, showing the handsome inlaid work and other ornamentation.

[Photo.—G. C. Clutton.]

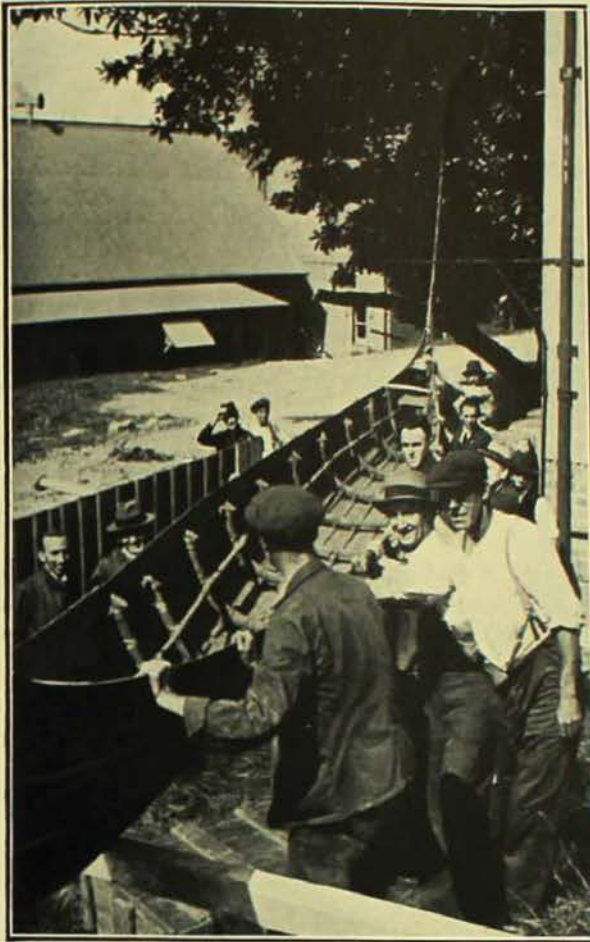


A Solomon Island tomako or war canoe, showing the tall prow and stern which partially protect the crew from arrows and other missiles of the enemy. The prow is decorated with white cowries, *Ovulum ovum*.

Block by courtesy of *The Sydney Mail*.]

[Photo.—*G. Toombs*.





The canoe in process of transference. Note its beautiful lines and sound construction. Seats rest upon the bearers attached to the ribs.

[Photo.—A. Musgrave.]

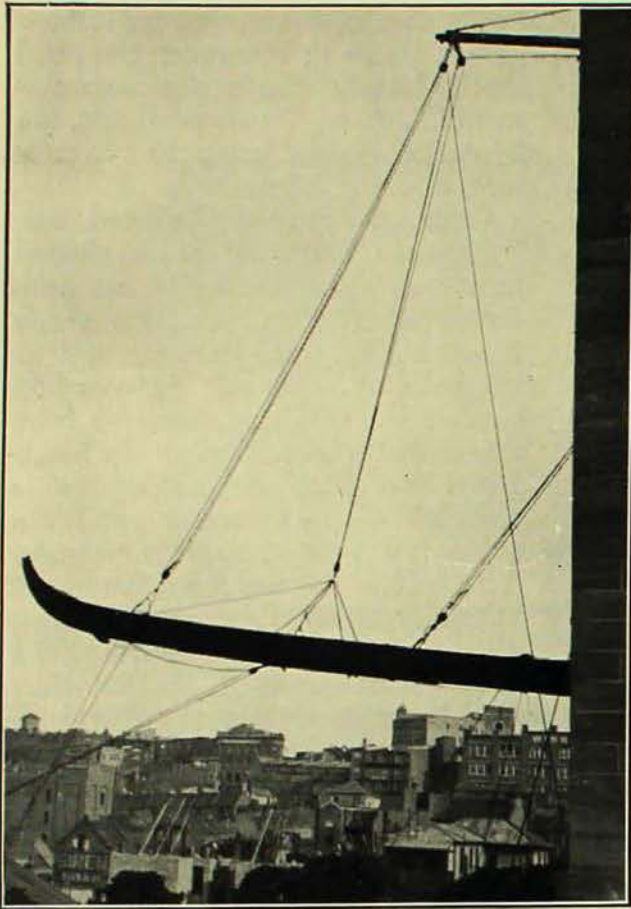
of inlaid sections of pearl or *Nautilus* shell, each piece of which is carefully and accurately carved into various patterns, which harmonise with those adjacent to it. These sections are embedded in the same putty utilised in making the various seams and joints watertight.

The process of inlaying is a wearying task. Each fragment has to be either rubbed or filed into shape and placed into putty whilst that is yet workable. The workmen who do this shaping are not necessarily skilled. A chief calls upon his dependants to supply these pieces, about one or two thousand per village, which the artist fashions into designs upon the canoe. The Solomon Islanders seem to be the only natives of Melanesia who favour this form of decoration. One will find inlay work on many of their productions, and this is an almost infallible guide in localizing native handiwork. Clubs,

bowls, combs, staves, etc., are treated in this manner; moreover, the pearl shell is largely used for personal ornaments such as breast pendants, the favourite design being the frigate-bird and the bonito.

Canoes are generally believed to be "dug-outs" or more or less shaped logs from which the centre has been hollowed out. This vessel, however, is a much more elaborate attempt at shipbuilding, and its lightness and slender lines conduce towards both speed and seaworthiness. In building a "tomako" a V-shaped keel is first laid down accurately, and the sides are built upon it in sections. The planks forming the latter are carefully fitted to one another, their edges being bevelled and having holes drilled through them so that they can be sewn tightly together with split cane or the stem of a climbing fern (*Lygonia*). The seams are caulked with a compound of red ochreous earth and tita resin, made from the fruit of a tree (*Parinarium laurinum*) which grows abundantly in the island jungles. Ribs, carefully selected and shaped, and to which the planks are lashed, keep the sides rigid and give them the correct curve. Seating accommodation is provided for twenty-two rowers, the seats being loose slabs which rest on a bearer or stringer much the same as those of our boats. Nineteen oval-bladed paddles were presented by Mr. Wickham with the canoe, and the whole is a wonderful example of the work of native artisans who, with a simple equipment of stone and shell implements, fashioned these wonderful vessels for their head-hunting expeditions.

Years ago, when the "blackbirder" and the "beachcomber" made the South Pacific their happy hunting ground, these canoes played a ghastly part in head-hunting and slave-raiding expeditions. Head-hunting was a strong feature of the life of the Solomon Islander, and numbers of these great canoes, with their occupants armed to the teeth, set off at intervals on these missions. They would glide along the coast in such a way as to be indis-



Hoisting the canoe—a difficult task. The window opening only allowed about an inch clearance on either side.

[Photo.—A. Musgrave.]

tinguishable, so much would they resemble the island reefs. The marauders dearly loved to take a village by surprise at dawn and, posting sentinels

at the exits of each house, they would tomahawk their victims as they attempted to escape. Or perhaps they would engage in a friendly transaction with the inhabitants, trading or buying slaves, and then suddenly turn upon their hosts. In this manner, whole villages were occasionally destroyed. These slaves, generally speaking, were well treated; but when a sacrifice was required to celebrate the launching of a new canoe, or something equally important, they supplied it.

Special houses were constructed in which the canoes were kept, and they were regarded as "tambu," or sacred, and reserved for men only. In them were also kept the heads of the poor unfortunates who made the sacrifice.

As raiding and head-hunting expeditions are now sternly discountenanced by the authorities, the need for these war-canoes is fast disappearing, and the time is not far distant when they

will be no longer manufactured, and the art of ship-building in the Solomons will die with those who, living to-day, alone understand it.

## Prize Essay Competition.

Mr. George A. Taylor has generously presented five guineas to be awarded as a prize for the best essay by a pupil of a New South Wales school, the subject being "A Visit to the Australian Museum." The competitors, who must be between the ages of twelve and sixteen on 1st March, 1924, may select any department or may write a general

account of the whole institution, the essay to contain 1500 to 2000 words. Teachers are asked to select the three best essays by pupils of their school and forward them to the Director of the Australian Museum on or before March 1st, 1924. The successful essay will be published in THE AUSTRALIAN MUSEUM MAGAZINE.

## The Mud-Dwellers of Kaimari.

NOTES FROM THE DIARY OF ALLAN R. McCULLOCH.

The accompanying photographs are published by permission of Captain Frank Hurley, and may not be reproduced under any circumstances.

October 7th, 1922.

WE are anchored at the village of Kaimari far up in the Gulf of Papua, and our little vessel, trim with wireless aerials complete, and the flying-boat "Seagull" alongside, compare strangely with the weird ravis and fantastic huts of the natives. Surely such circumstances as bring these ultra-modern contrivances into direct contrast with the dug-out canoes of primitive natives must be rare indeed.

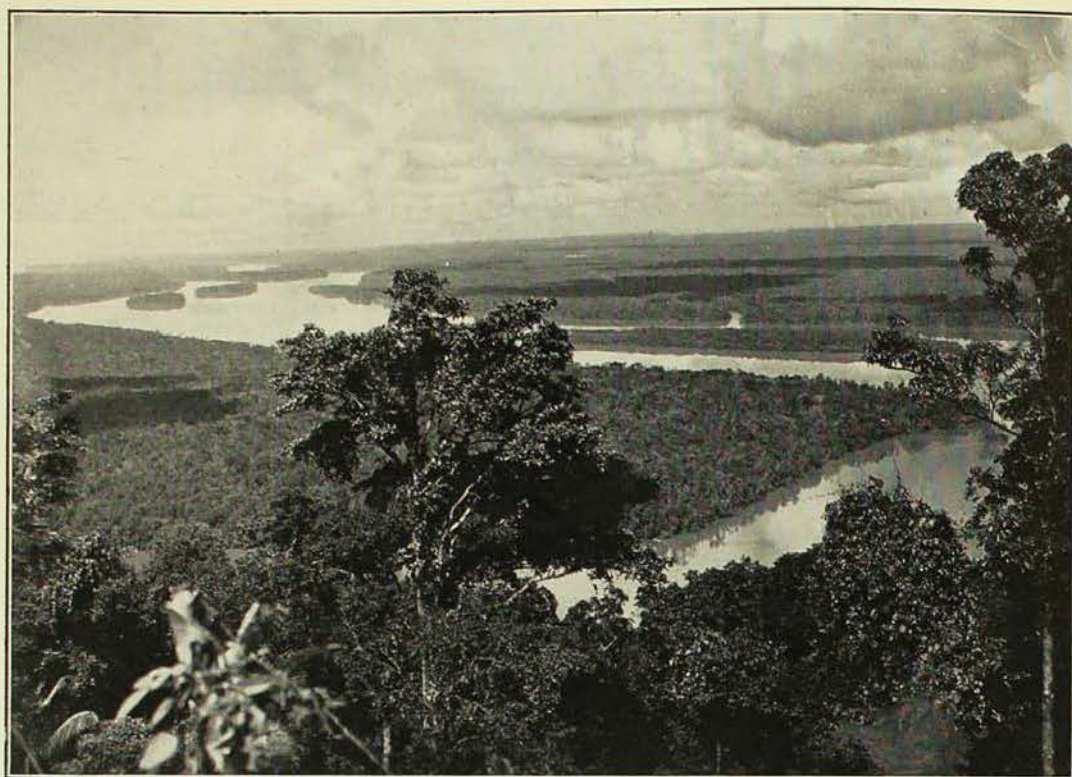
It is the heart of a huge mangrove swamp extending over hundreds of square miles, and we are walled in on all sides by wonderful and beautifully green mangroves, varied only with a few coconut palms which have been planted on some made ground. A myriad waterways intersect the forest, and swift tides run to and fro, flooding everything at the springs and exposing a huge expanse of mud-flats at low water. Strangely enough, we are not bothered with mosquitoes, the torrential downpour of rain which occurs nightly together with the tidal streams scouring the mud so thoroughly that they are unable to breed. Tiny sand-flies, however, appear as evening sets in, and cause some little annoyance with their irritating poison.

Kaimari is a queer village, and its inhabitants live almost entirely upon stick-platforms erected above the mud. The houses are on piles five or six feet high, and from each a narrow bridge-way leads out to the "road," which is likewise built of sticks laid upon countless uprights. These are sadly out of repair, and we are ever in danger of breaking through their rotten timbers, which are apt to roll under one's feet or tip up and so precipitate us into the soft squelchy mud below. The natives are very nimble upon them, and scatter in every direction at the slightest

sound of a crack. At high water fish, crabs, and wading birds move about beneath the houses, while large pigs and their families nose among the slime in search of food when the mud is exposed.

Most conspicuous among the numerous buildings are several huge structures known as ravis which are the fore-runners of our city clubs. The men foregather within them to smoke, feast, and while away the hours making dance-masks, etc. Twenty years ago, before the government took control, a ravi was the fortress of the village, and the warriors remained on hand ever on the alert against sudden attack. The women and younger children paddled off in their canoes to plantations in the mud, or went in search of shell-fish, crabs, and fish to supply the family larder. But now fighting is forbidden and, save when building canoes or houses, the men have but little to occupy themselves, so they sleep through much of the day, while their women-folk carry on the heavier work as has been decreed by custom.

Stepping ashore a few days ago, we made our way to the big ravi illustrated in the frontispiece. I took a tape-measure with me, and found it to be two hundred and eighty-five feet long and thirty-three feet across the entrance, while its curious peaked top rose to a height of sixty feet. It was short in comparison with a ravi of Kerowa, in Goaribari Island, which was four hundred and ninety-five feet from end to end, but its height made it more imposing than the longer one, of which the roof rose to a uniform elevation of only fifteen feet. We found a group of men sprawled about the entrance some sleeping, others yarning and smoking, and still others initiating some boys into the art of making fantastic masks or "kaivu kuku." These



THE DELTA REGION FROM AIRD HILL, GULF OF PAPUA.

Showing a vast expanse of mangrove forests intersected by endless waterways, which extends for hundreds of square miles, and is inhabited by strange mud-dwellers, who scarcely know what dry land is.

[Photo.—*Captain Frank Hurley.*]

vary from small hat-like masks to huge structures fifteen feet in height. They are constructed of fibre over a framework of cane, and wonderful patterns are woven upon the surface which are later picked out with red and black upon a white ground colour. A long beak-like snout represents the jaws of a crocodile and a grass skirt covers the bearer who carries the mask over his head upon a central pole.

Some hundreds of these, in various stages of completion, hung from the walls and along each side of a central aisle, and in the gloomy interior, with the smoke ascending from several fires, appeared so weird and impressive that we subconsciously moved among them quietly and spoke in subdued tones just as one does in a cathedral. All appeared so strange and grotesque that we felt we were enacting some scene from one of Sir Rider Haggard's African fantasies. The natives eyed us suspiciously, having little confidence in Hurley's cinema and other cameras, and a wholesome fear of the flying-

boat which had descended upon them like a demon from the skies.

Sullen and brown-skinned, they were scantily arrayed in their finery of dog's-teeth necklets, shell armlets, and head-dresses made of the gorgeous plumes of the Bird-of-Paradise. The coming of the 'plane called for much discussion among them, and some favored a retirement to the bush to hide from its baneful influence, while others believed its evil spirit could be propitiated with an appropriate sacrifice. We encouraged the latter idea, for it would be disastrous to lose such splendid "movie" subjects. Accordingly, the life of a large pig was abruptly terminated with a few well-directed arrows, and a procession of decorated bow-men proceeded solemnly towards the "Seagull," and laid the sacrifice ceremoniously upon her bow.

In addition to being a club-house, and fortress, a ravi is a native museum and the stronghold of the village sorcerers. The front portion is a general meeting place where the juniors, freshly

initiated into the status of manhood, foregather with their elders. Further back it is subdivided into cubicles which seem to be allotted to the males of different family groups. Each has its own fire-place of clay built upon a frame-work of cane, and bows, arrows, and other properties hang upon the walls. Long wooden hooks with a disc of bark above them are suspended from the roof, and serve to keep food, which may be hung upon them, from the ravages of numerous rats which find comfortable shelter in the thick thatch. But strangest of all are racks of human skulls adorning each cubicle, which are the remains of enemies. In days gone by the skulls of Kaimari numbered many thousands, and were added to as opportunity offered by raids upon neighbouring villages. So they were destroyed by order of the government, and but few are left. In Urama nearby, however, skull-racks are still preserved, and are greatly valued by their owners. We endeavoured to purchase them, offering untold wealth in the form of tobacco, arm-shells, brightly coloured cloths, and other things treasured by the natives, but our blandishments were in vain until we chanced upon a happy scheme. Hurley informed the owners, through an interpreter, that they were required for a great ravi in Sydney far bigger than any the Gulf had ever known, and wherein were stored skulls from north, south, east and west. And we told them this ravi would exist for all time, when they and their children's children were long dead, and that the skulls we asked for would be shown to everybody so that they might know what a great race of fighters the Urama people were. This flattery succeeded where all else had failed, and at last the old head-man Gormi went to his rack, and, after much deliberation, selected a skull which he exchanged for approved trade goods. His example was followed by the others, and Hurley succeeded in procuring a small number for exhibition in the Australian Museum. We packed them carefully in cases, the natives providing soft fibre for the purpose, and they

obviously approved of our appreciation of their treasures.

Beneath the racks of human skulls are ranged crania of pigs and crocodiles, and rows of strangely carved boards which seem to have some ancestral significance. They are conventional representations of a face, with many accessory decorative scrolls and angular lines, and, being coloured with red, white, and black pigments, demand attention among their sombre surroundings. They are of endless variety but each of the delta villages has some characteristic feature in the design which is carved upon these boards, and, though they are interchanged between the various villages, their source can be recognised by those who are familiar with them. We collected many at Kaimari which had come from quite a number of neighbouring villages, though by what means and why, we were unable to ascertain.

Hurley photographed all these strange decorations assiduously, expending endless plates and many hundreds of feet of film until his record was complete. We then passed on to a dark inner sanctum which was carefully screened from public view, though many presents of the coveted "kuku" (tobacco) had to be distributed before we were permitted to enter.

This portion of the ravi was over sixty feet long, but had narrowed down to twelve feet wide and was only eleven feet high. When our eyes had become accustomed to the darkness, we perceived seventeen queer figures made of interlaced cane, and in part resembling a four-legged cassowary with the yawning gape of a crocodile. Beneath each one was a strange bundle wrapped in spathes of palm-leaves and bound with cane. What was concealed within them, and what was their significance? It is part of a naturalist's training to be curious about things which are unknown to him, and the very fact that we were not permitted to touch them, made us desire more than ever to examine their contents.

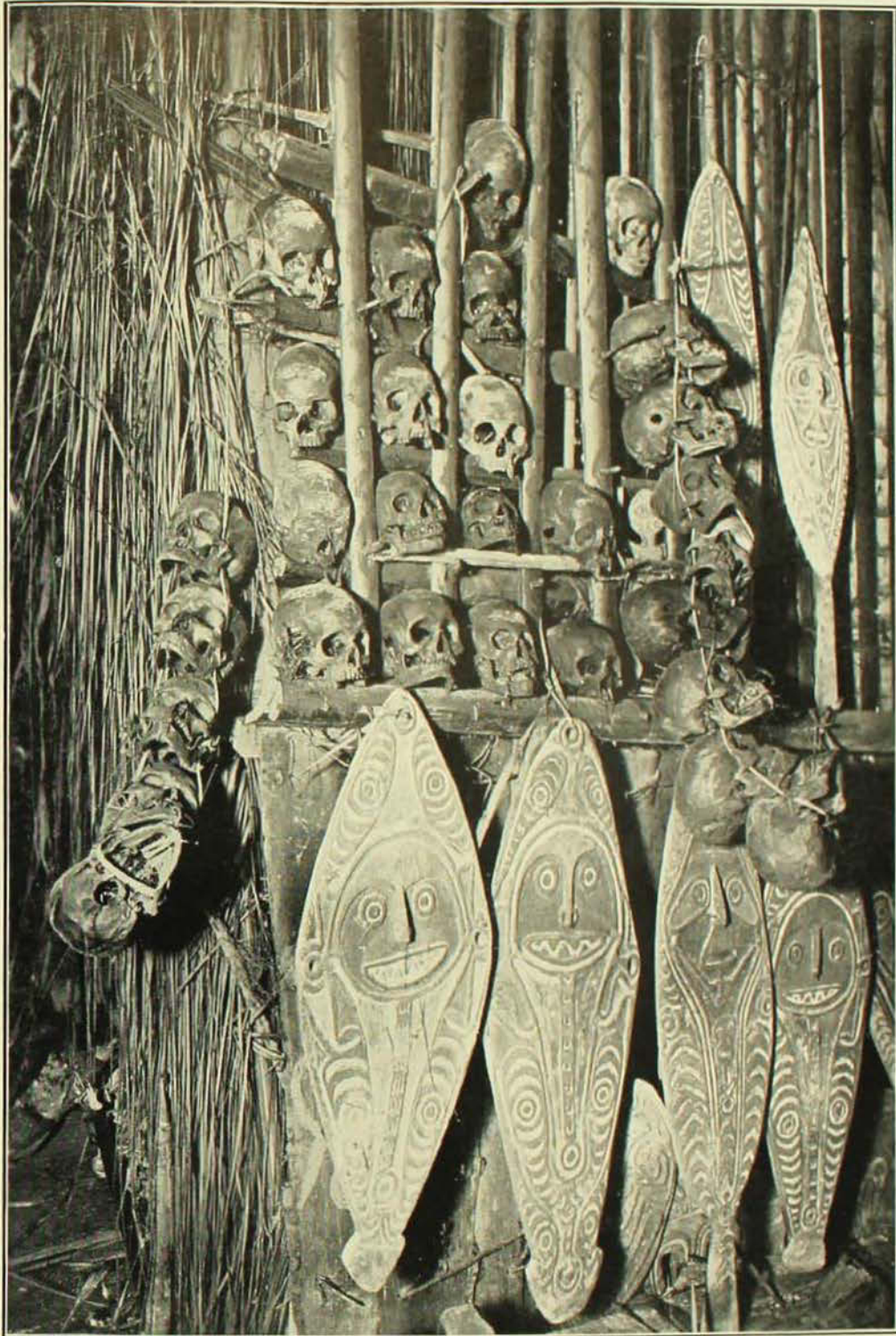
For several days we sought an opportunity of investigating and photographing these sacred precincts, and



A CENTRAL AISLE OF A RAVI AT URAMA, GULF OF PAPUA.

This picture illustrates the cubicles on each side of the building, with the skull-racks and properties hung upon the walls. It is constructed upon piles above the mud, and the water flows beneath it at high tide. The floor-boards are the bark of the Goru palm and the building consists of a frame-work of saplings thatched with leaves of the sago palm. Men alone are permitted to enter, it being considered that sickness would befall any women who were to gaze upon the sacred kaiva-kuku masks before the appointed time.

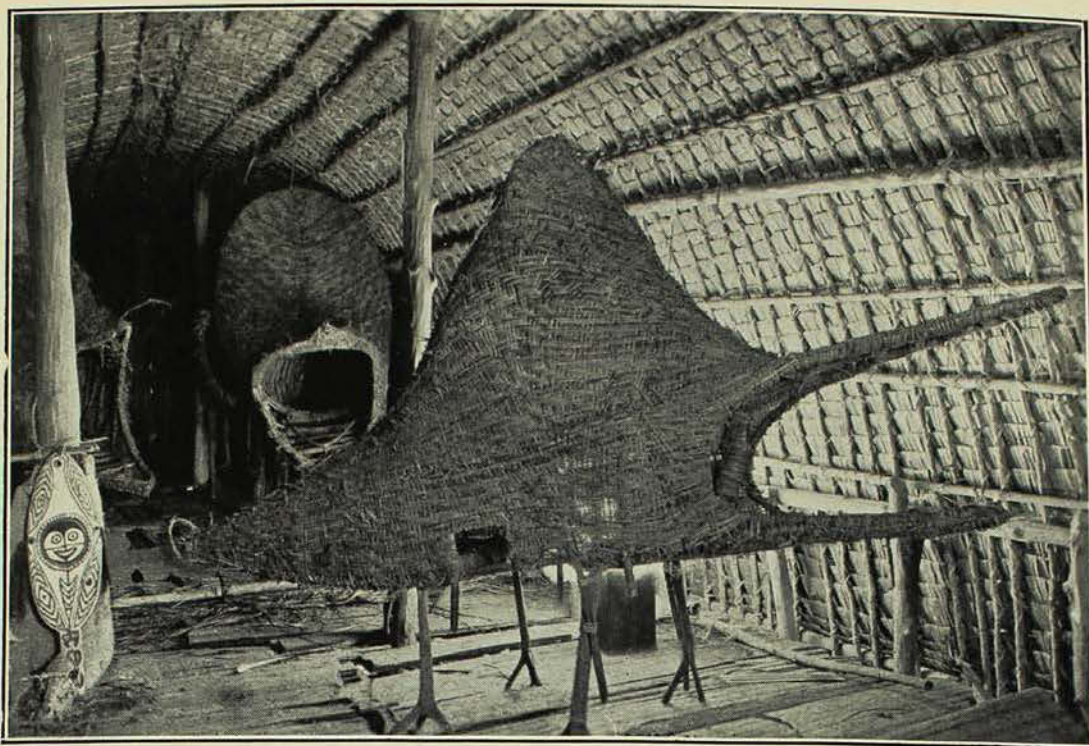
[Flashlight Photo.—*Captain Frank Hurley.*



A SKULL-RACK IN A RAVI AT URAMA, GULF OF PAPUA.

The skulls of enemies are preserved and handed down as heirlooms from one generation to another. They are greatly valued, and efforts to procure them for the Museum collection were usually unsuccessful. Some were procured, however, and it is hoped to exhibit them in the gallery arranged as here illustrated. The end of a ravi will be constructed and all the properties, such as dance-masks, carved gopi-boards, bows, arrows, etc., will be brought together in their correct association.

[Flashlight Photo.—Captain Frank Hurley.]



THE SACRED GOPI RAVI IN THE INNER SANCTUM OF A RAVI AT KAIMARI.

Cane figures of mystic significance which are seen by the senior men only. Fear of them serves to keep the younger men in subjection, who provide appropriate sacrifices which are confiscated by the attendants, or so-called sorcerers.

[Flashlight Photo.—*Captain Frank Hurley.*

fortune favoured us one day when all the village was gathered at the house of one who had died, and the ravi was left almost empty. With large bribes an old keeper of the sanctum was induced to permit the introduction of the cameras. The barrier screen was moved farther forward and one of the figures called "Gopi-Ravi" was posed before the camera. When all was ready a large charge of flash-powder was ignited, and the picture secured, which is represented on this page. Our old guide fled to the outer part of the ravi, and could be induced to return only when he perceived that no harm had befallen anybody.

Negotiations were then entered into for permission to examine the contents of the mysterious bundles, which, after much wrangling, was finally gained. The old chap was fearful lest the men should return to the ravi, and insisted upon haste. But this was not easy for the wrappings of bark and cane were very stiff and dry, and I had to lie prone on the floor in the cramped space, while spiders, lizards and scorpions ran

out over my hands as I untied them. I found each bundle to contain a number of "bull-roarers" or carved pieces of wood which create a humming or droning sound when whirled around on a length of string. Our efforts to purchase a bundle of them aroused much ill-feeling, a fact that was readily explained later when we learnt that each member of the ravi is apparently represented by a bull-roarer, and believes himself to be under the protection of the particular gopi-ravi under which it is stored. Such beliefs are cultivated by the older men or so-called sorcerers, who thereby dominate the younger members and so ensure their proper regard. The juniors are taught that pig is injurious to them as food, and likewise crocodile and other dainties, and that only the older hands can eat of them without evil consequences. We witnessed a number of young men returning from a successful hunt a few days ago, with four pigs which they had killed in the bush, and they chanted a wild song of triumph, while their canoes were decorated and



streamers of palm leaves hung from their arms. We supposed they would feast royally upon their kill, but discovered later that the older men were the only ones who benefitted. It was doubtless a sacrifice to the demands of the gopi-ravi skilfully manipulated by the older men in their own interests. Perhaps there had been an unusually violent whirling of the bull-roarers, through whose droning voice the younger men had received intimation of the wants of the gopi-ravi and their attendant rogues.

The canoes of the Gulf region are extraordinary craft, being merely hollowed logs without a keel and so lightly balanced that they topple over at the slightest provocation. Stranger still is their cut-away stern, which has nothing to prevent the ingress of water, and must needs, therefore, be plastered across with a bridge of mud. That they are well adapted to cope with swift running tidal currents is certain, and they are readily propelled against streams which would sweep our larger vessel away in spite of her motor. Every day we saw the good ladies of Kaimari paddling off to their plantations with several members of their families, each assisting with a paddle suited to his or her small size. Occasionally we hired a large canoe, and, loading in cameras and guns, were paddled through the maze of waterways in search of pictures and specimens for the Museum. We scarcely dared to move within them for fear of disturbing their balance, but our native canoesters stood upright, and, dipping their paddles rhythmically, drove us along at fine speed. Winding up long waterways we passed through a maze of forests, with the branches of the trees meeting over our heads and tempering the hot sunshine. Gorgeous green and black butterflies flitted through the undergrowth and gaily coloured kingfishers darted from the overhanging branches to snatch some unwary fish from the muddy waters.

The manufacture of these canoes is a very important feature in the lives of the natives of this region and plays

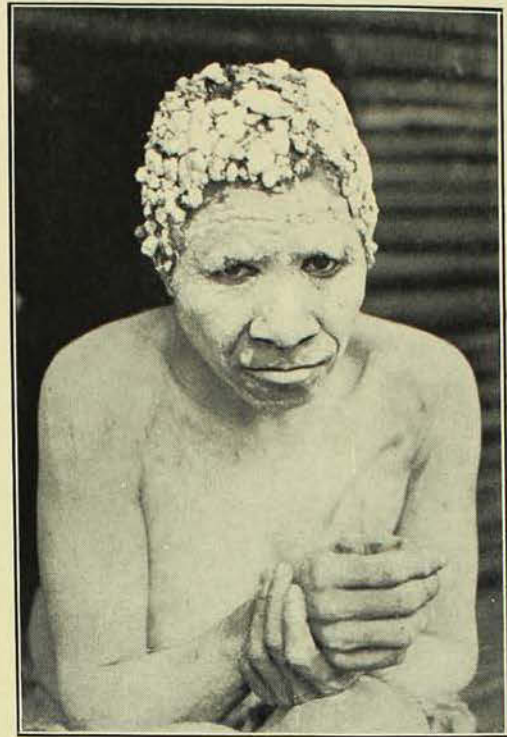
a prominent part in trading relationships with the natives of different parts of Papua. Each year, when the south-east trade wind is nearing the end of its season, large canoes from Port Moresby are tied together and a platform is built over them and fitted with shelters and large crab-claw sails. These are called lakatois and are sea-going vessels in which the Motuans travel north-west to the Gulf country and meet with the natives of Kaimari and other villages. They bring with them arm-shells, clay pots and other trade goods such as are otherwise unknown to the Gulf people, and exchange them for sago and new canoes. There are no trees suitable for canoe-making around Port Moresby, so they must be secured from districts farther west, and it is the business of the Gulf natives to supply suitable trunks. About Christmas time the lakatois make their appearance in the Gulf and trading commences, accompanied by feasting and general merry-making. The "kaiva-kuku" ceremonies take place and the giant masks that have taken so long to prepare are brought out of the seclusion of the ravis. They are exhibited in public for the first time, the women and children witnessing the dance that takes place. But their life is brief, and they are soon cast into a fire to complete their sacred cycle. Their destruction is apparently all important and may not be varied, so that our efforts to secure specimens were futile though we offered wealth beyond comparison in exchange. It is even against the rules for them to leave the ravi until the time comes for the dance that ends in their destruction, but Hurley managed to arrange a special rehearsal performance in which over one hundred masks appeared and which he successfully filmed. It was firmly believed that if any woman or children caught sight of these kaiva-kukus, they would surely perish, so a large screen was erected upon a platform in front of the ravi to hide them from public view. At Urama, where kaiva-kuku danced likewise for us, all the women and uninitiated boys were dispatched from the village in canoes at

dawn, and none but the men remained dressed in all their barbaric finery.

The endless mud and the fact that much of their lives is spent in canoes has induced the Kaimari people to adopt an extremely simple type of clothing. This never draggles in the mud and offers but little restriction to any movement. The mud itself is often utilised as a partial covering, and many Kaimarians are plastered with it for one reason or another. As a mourning costume it is in general favour, and widows smear themselves with it so thoroughly as to almost hide their identity. String armlets and necklets likewise indicate family bereavement and, combined with the mud, serve to produce a distinctly unhappy effect. Before retiring for the night small children are likewise smeared over by their fond parents to protect them from the bites of irritating pests.

The Kaimari village is large, including perhaps fifteen hundred residents and the food-supply of so large a crowd is an important feature. They obtain many fish by setting barriers across tidal creeks to trap those which enter them at high water. Crabs and shell-fish are also plentiful in the mud and wild pigs are occasionally captured in the mangrove forests, but most important is the wild sago, which flourishes along the banks of the water-

In a lecture, "Passing of Wild Animals," delivered at the Museum recently Mr. A. S. Le Souef, Director of the Taronga Park Zoological Gardens deplored the fact that wild animals are disappearing before the advance of civilisation. This is happening in every country in the world and is perhaps inevitable, for man has to choose between domestic and wild animals and naturally prefers to have the land reserved for the former. In America, Africa, Asia, Australia, the story is the same, though here the forces of extermination have not yet proceeded so far as in the older countries. It has often truly been stated that the indigenous mammals of Australia are the most interesting in the world, and it behoves us to take what steps are



A widow plastered with mud.

[Photo.—Captain Frank Hurley.]

ways and not only supplies the mud-dwellers with food but also provides a surplus which is traded with visitors from other districts.

It is intended to construct an exhibit in the Australian Museum galleries representing a portion of a Urama ravi in which the masks, weapons, and other properties will be exhibited in their proper association.

possible to prevent, or at any rate postpone, the threatened extinction of these original inhabitants of our continent.

Several of the delegates at the Pan-Pacific Science Congress visited the Museum during the Sydney Session and, on August 29th, the Section of Anthropology and Ethnology came as a body under the leadership of Professor A. C. Haddon. The delegates were received and welcomed by the President, Dr. T. Storie Dixon, and conducted round the Ethnological galleries by Mr. W. W. Thorpe. On August 30th the section held its ordinary meeting in the Museum Lecture Hall, and Dr. P. H. Buck, delivered a cinema lecture on the arts and crafts of the Maoris.

## "The Beachcomber" and His Tropic Isle.

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

IT was pleasant, after a stormy passage from Townsville, to see "The Beachcomber," a slim figure in oilskins and sou'wester, wave a greeting from his tossing launch, in Brammo Bay. We made the coral beach in

darkness, and presently I was following my host through coconut palms to the bungalow.

While the storm raged, we sat indoors, and talked at ease. I heard Dunk Island news, and stories of the



"The Beachcomber" in his bungalow garden. A characteristic portrait.

[Photo.—C. Barrett.]



The Bungalow, Dunk Island. Viewed from the coconut avenue leading to the beach in Brammo Bay.

[Photo.—C. Barrett.]

tropic sea; and gave, in return, a budget from the busy world, which my friend, so many years ago, had counted well lost for the peace and beauty of his favoured isle. I have golden memories of my busy-idle days as Mr. E. J. Banfield's guest, and the letters he wrote to me are so crowded with pictures of the isle and its wild life, that, reading them, I win back the pleasure

of our rambles together. It is hard to believe that he is dead.

His years were no burden to "The Beachcomber." I marvelled at his vigor, as I toiled after him through the brush, or along the sunlit beaches. He tired me often, but showed no sign of fatigue himself. And all the way he talked delightfully of the joy of life on a tropic isle, of birds and their ways,

and, more rarely, of war and its aftermath.

You have read "The Beachcomber's" books, and need no detailed description of his island. I give you only a visitor's impressions, with glimpses of wild things seen around the bungalow and farther afield.

For two days the rain continued; then came a clear, calm day for "exploring." But, for a while, I was content to observe near home, to loiter in the garden, and ramble through half-tamed country a little beyond, with, for variety's sake, a stroll along the beach in search of shells.

#### GARDEN ACQUAINTANCE.

A tropic garden never fails to yield spoil to the naturalist; nowhere have I found a richer "field" than that about Dunk Island bungalow. When, on the first morning, I surveyed the little rain-drenched world from shelter, unfamiliar scents and sounds crowded to greet me, and I saw birds and blossoms that were old acquaintances, because they seemed to come straight from the pages of my good friend's books. He has described them so faithfully, you see, and with the perfect understanding of the true naturalist.

A coucal (*Centropus phasianus*) flew heavily from the grass into a small tree, shaking rain drops from leaf and bough as it alighted. It saw me, not three yards away, but showed no sign of fear. Soon it commenced to utter the mellow "Glooc! glooc!" notes, like the gurgle of cream from a bottle, as "The Beachcomber" has said. Later I heard the resonant "Toom! toom! toom! toom!" and some other notes. For the swamp pheasant is a gifted vocalist, though most of us are familiar chiefly with its "glooc! glooc!" call. Every day, on the isle, I heard the coucal's voice; and once, near the bungalow, I came upon one so busy in the high grass that it failed to rise until I was barely a yard away. Mr. Banfield befriended all the wild birds of his demesne, and even a stranger shared a little in the confidence that his

kindness had won from the coucal and some other species.

Honeyeaters were calling in the rain, and I heard the notes of an unseen dove—the barred-shouldered species—(*Geopelia humeralis*), which tried my patience as a photographer, at a nest on Masthead Island, long ago. Fruit-pigeons, too, were calling, in trees beyond the garden fence; and perhaps the friendly little green *Chalcophaps* was pecking on the ground beneath the boughs.

#### SPLENDID BUTTERFLIES.

Though the weather "lifted," I still found it profitable to remain near home; the garden lured so many birds, and a host of butterflies. Nowhere, except on a spring day's journey from Jerusalem to Bethlehem, have I seen such troops of splendid butterflies. Over the crimson Hibiscus flowers, swallow-tails (*Papilio ulysses*) and "bird-wings" (*Troides priamus*) hovered or soared on widespread, shining pinions. There were scores of these glorious insects about the Hibiscus hedge, and all other flowering plants in the garden had their wooers too. I noted nearly twenty species, and not a dingy-colored "fly" among them. Some were smaller than the common "painted lady" (*Pyrameis cardui*), but rivalled in brilliant coloring the huge papilios.

On an orange tree near the window from which, each day, I saw the mists of the morning rise, both caterpillars and pupae of a swallowtail were found. These larvae were protectively colored; but compared with those of another species (not identified), they were bold advertisers of their presence. The unknown caterpillar, viewed from a distance of barely a yard, resembled one of the grey-brown leaves on which it had been feeding—a leaf nibbled curiously on one side of the mid-vein, and hanging "face on."

In the garden also were many strange insects; a mantis which, facing one, tried to mimic a tiny pink and green flower; and, on the under surface of broad *Macaranga* leaves, gem-like bugs, all emerald green, camouflaged as



Mound of the Scrub-Fowl (*Megapodius reinwardt*) in the shade of a giant fig tree, growing on the edge of the jungle.

[Photo.—C. Barrett.]

beetles. I gathered, around the bungalow, a tube full of real beetles, and one proved to be a new species. Shells and insects alone were collected during my stay on Dunk Island. This place for years has been a sanctuary, and tabu to the man with a gun. Had I been a mammal or bird collector, "The Beachcomber" would never have given me the freedom of his isle. But he did not forbid a modest toll of insects and mollusca.

#### THE MOUND-BUILDERS.

Of "The Beachcomber's" favourites among the bigger birds, I saw little, but I heard their curious calls, and examined several "nests." The scrub-fowl (*Megapodius reinwardt*) likes the sound of its own voice and is vocal both night and day. It prefers shadowy places, and I never saw one in the open. But the island birds have become confiding, at least when visitors are not present. Soon after I had departed, Mr. Banfield wrote, describing the "circumloctuary" gambols of scrub-fowls

in the bungalow garden. This species, so remarkable for its nesting habits, is also a clown, it appears. "The Beachcomber," in his *Confessions* says that it has no ear for music: "It seems to have been practising 'cock-a-doodle-doo' all its life in the solitary corners and undergrowth, and to have not yet arrived within quavers of it."

A mile from the bungalow, on the fringe of the forest, there is an unused mound of *M. reinwardt*. It was, when I saw it, like a weather-worn hillock, and grasses and other plants were growing upon the summit and slopes. Beneath the boughs of a great fig tree (*Ficus sp.*), it was shadowy and moist; although as the sun descended, it received a promise of light. Other mounds were seen in the jungle, some distance from the sea. The birds were heard calling near them, and one was being "worked."

#### SMALL FRIENDLY BIRDS.

None of the island's tame-wild birds



Brammo Bay Beach, Dunk Island. A Flame Tree in foreground, whilst in the distance is seen the Queensland mainland.  
This beach was Mr. Banfield's favourite promenade.

[Photo.—C. Barrett.]

charmed me more than a honey-eater, which came every day to feed upon a bunch of over-ripe bananas hanging in a shed. From its favorite perch, in a tree nearby, it would fly straight to the pendant fruit, provided solely for its benefit. A few quick pecks, and back to the bough; and thus many times, until hunger was appeased, or some sudden fancy took the bird away to the jungle creek. "Jacky," if I remember aright, was the name of this feathered pensioner.

The sunbirds (*Cinnyris frenata*) were not nesting when I stayed at Dunk Island, but they foraged about the bungalow, and so I had the rare pleasure of seeing Australia's "humming birds" at their best. They are beautiful small beings, active and graceful as Oberon's people, but rather assertive than gentle, in regard to their "place in the sun." I never tired of watching them flash from flower to flower, in the

sunshine, or visit the cool verandah, where, in some seasons, they select a building site. "The Beachcomber" has described their aerial frolics when the flame tree's flowers are due; how they gather, six or more, in a circle, and "with uplifted heads directed towards a common centre," utter their twittery song notes in unison.

#### THE DRONGO AND OTHERS.

Trees in the neighborhood of the bungalow were frequented by the curious drongo-shrike (*Chibea bracteata*), the "bully, swaggerer, swashbuckler," of a biography in *Confessions of a Beachcomber*. He is a permanent resident, and his actions indicate that he regards himself as, at least, one of the lords of the isle. Though a bully, and "boastful," he is no coward, for bigger and stronger birds go in fear of the drongo. I walked right beneath a fish-tailed, scolding "king-crow."

He became silent, but did not leave his perch on a high bough. When nesting cares are over, this noisy and assertive fellow becomes quiet and peaceful; he is seen far more often than he is heard.

Concerning the nutmeg pigeon (*Myristicivora spilorhoa*), I can say little from personal observation, for only the fore-runners of the flocks had arrived among the islands when I departed south. But my host told me that the days of migrating multitudes had gone, perhaps for ever. This splendid species, once so amazingly abundant, is threatened with the fate that befell the passenger pigeon of America. Nutmeg or Torres Strait pigeons have been ruthlessly slaughtered for "sport" in the nesting season, on the Barnard Islands and other haunts of the species.

In his last letter to me, Mr. Banfield urged the need for strong measures to "save the nutmeg pigeon."\* He was ever ready to champion wild birds, and, in North Queensland, no one has done more in the cause of protection. I know that he had fears for the future of other birds besides the nutmeg pigeon. From his own island sanctuary some forms have disappeared, or become rare, notably pigeons and sea birds. Various destructive agencies are responsible, including a cyclone, when the tern rookeries were wrecked by a raging sea. But the man with the gun must answer for the pigeons' scarcity.

#### BEACHCOMBING.

Day after day we walked abroad, my host and I, and I learned a little of the gentle art of beachcombing. We paraded the beach in Brammo Bay, from the boatshed to the point, sometimes gazing over the water, but more often with bowed heads, scanning

\* Before he died, his efforts to gain protection for the pigeons were crowned with success, I believe.

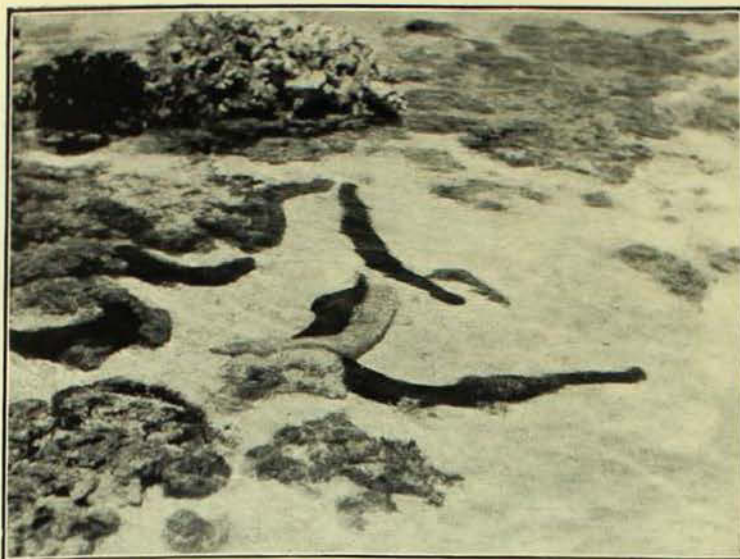


Nest and egg of the White-capped Noddy (*Anous leucocapillus*). These birds nest in thousands among the Capricorn Isles.

[Photo.—C. Barrett.]

the sand for shells and any strange creatures that the sea had forsaken. Our harvest was poor one morning, and rich the next. On the western beaches, in our longer rambles, we gleaned nuts and hard shelled seeds, that had drifted from other isles. And here we saw many birds, reef-herons, and noddies and other terns. None of the sea birds was nesting, but the croaking call of a white-capped noddy (*Anous minutus*) brought to memory the scene on Masthead Island, where, in early summer, these dainty little sea-swallows have thousands of nurseries among the *Pisonia* trees. Bare-footed, like my friend, I went on little "coastal" journeys; but, wading over the reef at low tide, I found even stout rubber soles a poor protection; coral fangs cut the soles to pieces. Bare-legged, but leather-booted, reef roaming became a very pleasant occupation. Mr. Banfield knew Brammo Bay "like a book," and he guided me to favorite spots in his tropic sea garden. We saw wonderful corals and shells, and a host of curious animals, including a mantis-shrimp, which, captured after a chase through shallows, now has a home in the Australian Museum. In the reef pools, sea-slugs or bêche-de-mer (*Holothurians*) were seen crawling over the sand. Some,





In the reef-pools, sea-slugs, or beche-de-mer (Holothurians) were seen crawling over the sand. Some species are black and slimy, others coral pink or red.

[Photo.—C. Barrett.

black and slimy, were covered in sand grains; others were red and shiny, with blunt spikes on their leathery bodies. When I touched one of the slimy "slugs," it contracted, and ejected scores of thread-like filaments, white and sticky. Among the coral, cowries, giant clams (*Tridacna*), ear shells (*Haliotis*), and many other kinds, were discovered in abundance. The gem of the garden, for me, was a disc of *Fungia* coral, quaint but beautiful, and with a fairy-tale life history. But indeed, all the corals are wonderful, though the "toiling coral insect" is no longer praised by preacher and moralist, who, like the rest of us, have now a little knowledge of marine zoology.

#### TURTLES AT HOME.

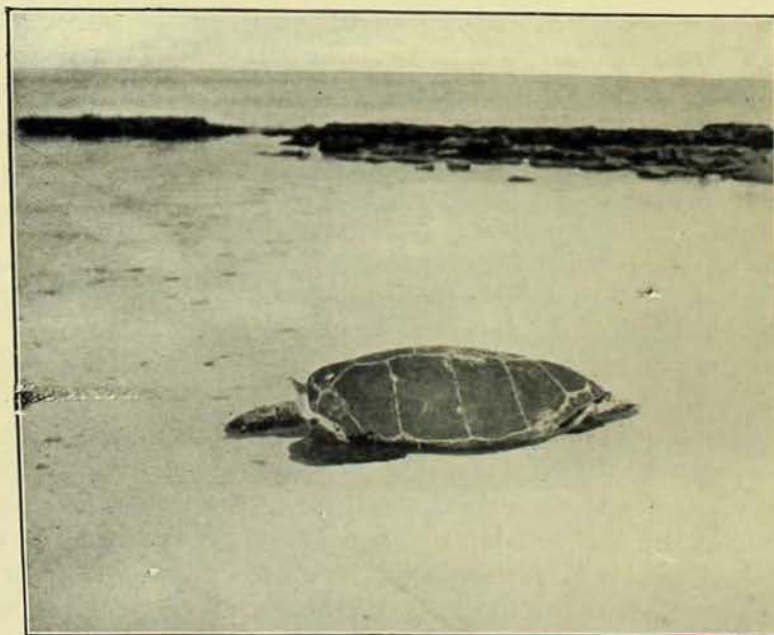
The green turtles (*Chelone mydas*) frequent Dunk Island waters, and their ways have been described by "The Beachcomber." My own acquaintance with them was made much farther south, among the Capricorns.

On Masthead Island beaches they were often seen, and at North-west Island I counted more than one hundred, ashore or in the lagoon. It was easy enough to enjoy a turtle ride, if one caught a reptile napping. Only, the ride was short, and exciting when the turtle reached the sea. I never could gain De Rouge-mont's skill and guide my steed, or keep its head above water when it entered the lagoon.

On the northern isles, green turtles make their nurseries. The eggs are deposited in hollows

scooped in damp sand, on the fringe of the scrub. They are covered deep, the sand is smoothed down, and the turtles return to the sea. When the eggs hatch, the baby turtles must make a perilous passage to begin their aquatic life. Crossing the beach, numbers must fall victims to birds of carnivorous tastes.

When the net was drawn near the boatshed, strange fishes often were revealed. Some were good eating; and others, bizarre in shape and coloring, most suitable for an aquarium,



The Green Turtle (*Chelone mydas*) frequents these waters and nests on some of the coral beaches amongst the isles.

[Photo.—C. Barrett.

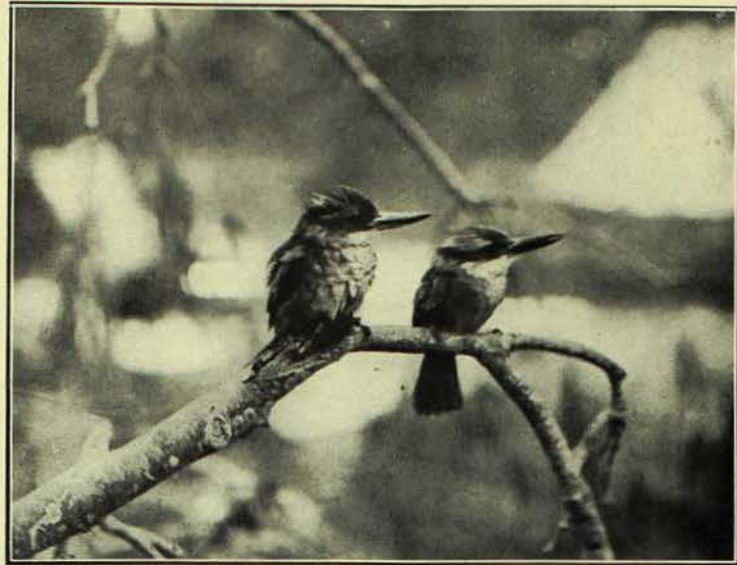
or the zoologist's specimen tank. The midget beauties that dwell among the corals, of course, were never netted. To see them we had to wait for low tide, wade knee deep, and find a pool where coral masses could be broken easily. From the fragments, if we were lucky, the little fishes appeared, to dart away like flying splinters of many-colored glass. There were crabs, too, in vivid scarlet; but neither crustaceans nor fishes were lovelier than big anemones and the mantles of *Tridacnas*. All the rainbow's colors are seen on a coral reef.

#### THE SWIFTLETS' CAVE.

"You *must* see the Swiftlets' Cave," my host declared. The launch was out of action—"engine trouble"—so we had to make the trip to the rocky landing-place, on the island's weather-side, in a dinghy. Not a comfortable pull, when we left the shelter of Brammo Bay, and switchbacked over heaving seas. It was worth while though. You see, folk who have visited this famous nesting place of the grey-rumped swiftlet (*Collocalia francica*) number barely a score. It was a privilege to be taken there by the discoverer.

The cave, though close to the water's edge, is deep in jungle growth, and one might search for hours without locating it, though aware of its near vicinity. "The Beachcomber" found the swiftlets' colony in this gloomy cave (which is not entered by man with ease) through the excited fluttering of birds that he could not see. The nests were fastened to the "roof" with a semi-transparent substance, secreted by the builders. There were more than fifty of these strange, shallow nurseries; many contained one pearl-white egg; the others were empty, in some cases not completed.

I had read of this cave in *My*



Amongst the Island's bird visitors was the Sacred Kingfisher (*Halcyon sanctus*).

[Photo.—C. Barrett.]

*Tropic Isle*, and the star item of my Dunk Island programme was to pay it a visit. Only an ardent naturalist can know what joy I had in reaching the cave, and peering up at the swiftlets' primitive nests. Discomforts of the dinghy voyage, the landing on wave-swept rocks, and the scramble among great boulders in the jungle, were less than trifles now. I was weary and limp with heat, and had lost fragments of skin in breaking a path to the cave; but never, in Birdland outings, have I felt happier than I did in that silent, gloomy spot, walled and roofed with rock.

Doubtless, for many years, the cave will keep its secret from all but naturalists, and other folk who go on pilgrimage to Dunk Island determined to "see everything." How will they find it, I wonder. I could not be confident of locating it myself, without a long search in the jungle.

Mr. Banfield once captured a swiftlet on her nest, placing a hand gently over her. She fluttered for a few moments, and became quiet again. Returned to the nest, she settled down, showing no fear. The breeding season had not commenced at the time of my visit, and no birds were seen near the cave. But often, from the bungalow, I had watched swiftlets skimming high over trees on the hill-side. Their nests



"The Beachcomber's" Boatshed, Brammo Bay beach. In the foreground is seen the beautiful Umbrella Tree, one of the most remarkable trees in the world, and a "sight" not to be missed by any visitor to Dunk Island.

[Photo.—C. Barrett.]

may not be very palatable, but they are cemented with the birds' saliva (coagulated), and in substance and general appearance resemble those of the "edible nest" species, which form a Chinese luxury.

#### SERPENTS IN EDEN.

A Pocket Paradise, Dunk Island has been called, and, like the Garden of Eden, it is not free from serpents. I saw some in my jungle walks; and when stripping bark from a dead tree in search of beetles, nearly placed my hand on a venomous species. The death adder (*Acanthophis antarctica*) is not rare, and its slothful habits and obstinacy in declining to move when one approaches without perceiving it, make it more dangerous even than our most aggressive snake, the tiger (*Notechis scutatus*).

"The Beachcomber" often walked bare-footed in "snaky" spots; and I, on one occasion, was constrained to follow his example, but without enthusiasm. We had been wading on the reef, and took a short cut through the brush, and, as we went, my companion cheered me with a story of a Queensland girl's hairbreadth escape. She placed her hand on a sunlit boulder within six inches of a basking adder. Looking down carelessly she saw the reptile and went pale to the lips with fear. The hand was lifted swiftly before the adder moved.

#### TROPIC PLANT LIFE.

With all his love for bird life and creatures of the sea, Mr. Banfield found time to botanise. His pleasure it was to learn the names and virtues of tropic trees and shrubs, and the more lowly

plants of his island. He had favourite trees, he told me, and often I saw him lay his hand on a slender bole, almost tenderly. His knowledge of plant lore was equal to that of many amateur botanists who devote all their leisure to the study. He knew living plants, as he knew living birds and butterflies, and has praised them in perfect prose.

Dunk Island is a great wild garden. When my friend was busy at some task in which I could not share, I wandered alone to the Valley of Tree-ferns, whence the bungalow's water supply is drawn by an ingenious system of pumps and pipes. There, deep in shadow and silence, I saw at the hub of its web, a large and beautiful spider that was almost a pet. Fairy foliage was all about, and the fringe of silence was stirred by a sleepy murmur of water, sliding over stones below my resting place.

The trees and shrubs and creepers of the jungle were bewildering in variety, and many were quite strange to me. Beach plants were more familiar. The handsome but nearly branchless *Macaranga tanarius*, whose slender stems, straight as a rod, were used, long ago, by the natives for fish-spear handles, grew freely in many spots.

On July 11th, in the presence of the Hon. A. Bruntnell, M.L.A. Minister for Education, and Mr. S. H. Smith, M.A., Under Secretary, Department of Education, Messrs. J. McGeorge and E. Brandon Cremer presented a cinema film "Astronomers and Aborigines." This depicted doings of the party under the direction of Prof. W. W. Campbell, at Wallal, which observed the total eclipse of the sun at that locality on September 21st, 1922.

The film clearly showed the difficulties which the party had to contend with and overcome, and is well worth seeing by those interested. It is interspersed with pictures showing the life of the aborigines, and this contributes to its general interest.

On the big, flat leaves, I searched profitably for insects; one yielded a wonderful *Brenthid* beetle, not hitherto recorded from the isle, and many of the shining green bugs, mistaken at first for rare beetles.

Dunk Island trees include splendid specimens of *Brassaia actinophylla*, "unique among the many novelties of the tropical coast," as "The Beachcomber" has said. Close by the boatshed, they stand in groups, and give unfailing pleasure to a nature lover's eyes. My friend was proud of his umbrella trees, and he loved to tell his visitors their history. I shall quote from *Tropic Days*, the passage read so often on the isle:—"Queensland has a monopoly over this handsome and remarkable tree, the genus to which it belongs being limited to a single species occurring nowhere else in a native state. Discovered by Banks and Solander at Cooktown in 1770, the second record of its existence, it is believed, was made from specimens obtained on this island by MacGillivray and Huxley in 1848." And the very trees that the naturalists of the *Rattlesnake* admired, may be those in my photograph, which pleased "The Beachcomber" beyond all others that I obtained in his realm.

During a recent cruise of the *Germanium* in the Gulf of Carpentaria, Dr. W. E. J. Paradise, R.A.N. interested himself in collecting specimens for the Museum and secured a particularly valuable collection of fishes. A number of these have not been previously recognised from Australian waters, and they are clearly related to the estuarine forms of the great rivers of Papua. A considerable quantity of fish was utilised as food by the ship's company, and Dr. Paradise's notes upon them afford valuable data as to their edible quality and abundance. By arrangement with Dr. Paradise, duplicates of the fishes will be forwarded to the Queensland Museum.

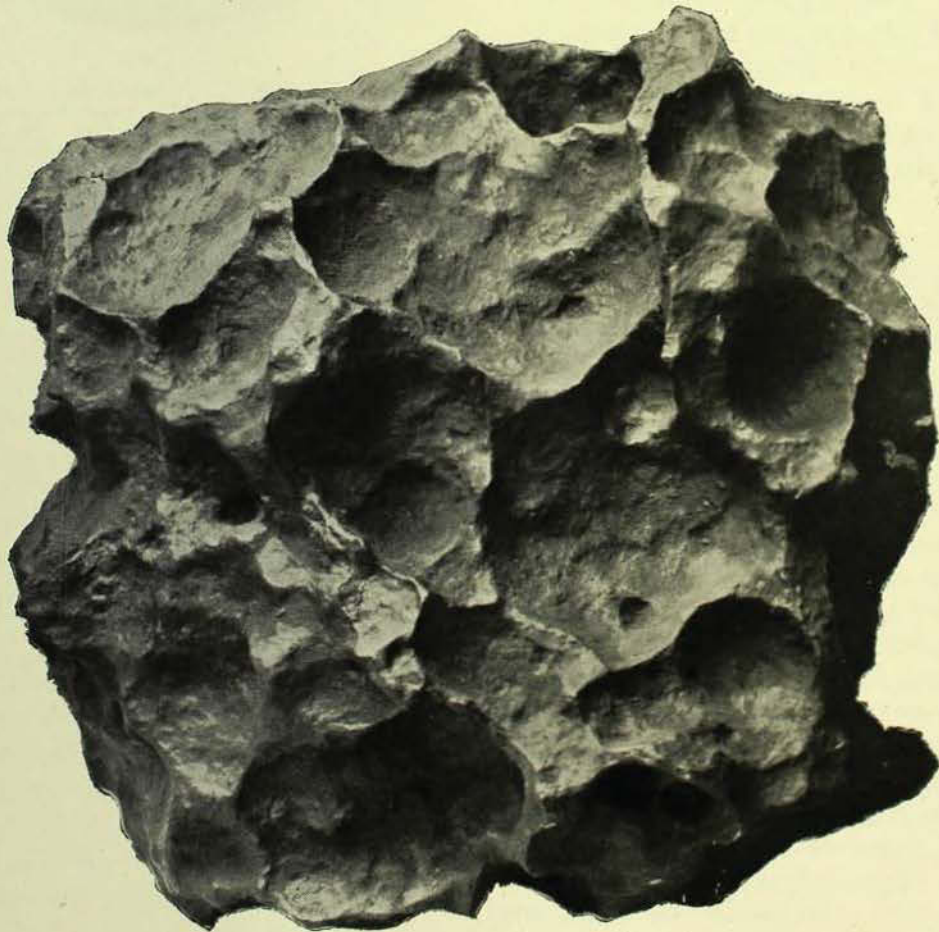
## Meteorites.

BY T. HODGE SMITH.

**N**UMEROUS attempts have been made of late years to receive messages from the planet Mars, but, as a matter of fact, we have long been receiving messages probably from far greater distances; they have been coming to our earth from time immemorial and have been collected and carefully preserved in museums. With the exception of spectroscopic analysis they afford the only real evidence of the composition of things outside our atmosphere. Science has given the name meteorite to these messages, which are in reality masses of iron and mineral matter. Everyone has seen on a clear night shooting stars or meteors; these are identical with meteorites, and as

many as fifteen to twenty million enter our atmosphere every day. Only a few ever reach the earth's surface, for the majority are dissipated by the intense heat produced by friction with the atmosphere, while others are travelling in such a direction and at such enormous speed that they are able to keep on their course and resist the attraction of the earth.

Our ancestors looked upon the stars as the abode of the gods, and consequently the shooting stars, or falling meteorites, signified to them the arrival on earth of a god or his image. Thus meteorites were worshipped, and they were kept as sacred objects in specially built temples. The early



The "Mount Stirling" Meteorite (siderite) found at Mount Stirling, 130 miles east of Perth, Western Australia. Observe the irregular shape and characteristic depressions termed "thumb-marks."

[Photo.—G. C. Clutton.]

Greeks called them "Betyls," probably from the Hebrew word *Bethel*, meaning home of God. From about 300 B.C. to 300 A.D. coins or medals were struck by kings in honour of these supposed divinities.

A great number of theories have been put forward to account for the origin of meteorites, but as Professor Sir T. H. Holland has said, "the number and variety of theories concerning a subject often forms a coefficient of our ignorance." All that can be said with certainty is that they come from outside our atmosphere and perhaps from outside the solar system.

The size of meteorites varies very considerably; for example the "Ahnighito" meteorite found at Cape York, Greenland, in 1818, weighed thirty-six and a half tons, while another found at Muhlau, near Innsbruck, Tyrol, in 1877, weighed only seventy-seven grains. The largest meteorite yet found in Australia, at Cranbourne near Melbourne, Victoria, weighed three and a half tons, and is now preserved in the British Museum (Natural History), London.

The external appearance of meteorites also varies; some are quite smooth, while others have characteristic indentations which have been called "thumb-marks"; some are more or less spherical or pear-shaped, others are quite irregular.

The analysis of various meteorites has not led to the discovery of any element that is not found in the material of the earth; on the other hand only about one-third of the elements found in the earth have been found in meteorites. However, certain chemical compounds are found which do not exist, or at least have not been found, as terrestrial minerals, for example oldhamite (monosulphide of calcium), troilite (monosulphide of iron) and schreibnerite (phosphide of iron and nickel).

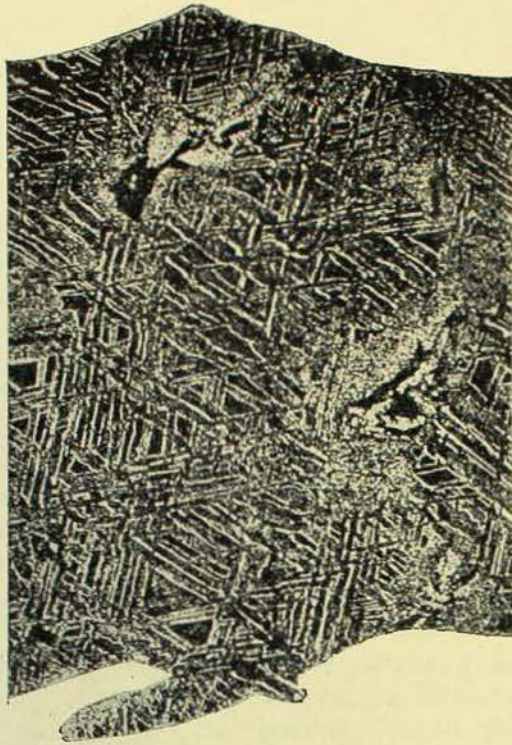
The chemical composition of meteorites is by no means constant, and they



The "Bugaldie" Meteorite (siderite) found at Bugaldie, near Coonabarabran, New South Wales. Note the comparatively smooth surface.

[Photo.—G. C. Clutton.]

have been classified according to this variation into four classes, the first of which is represented by the metallic meteorites or Siderites. These are composed essentially of various alloys of iron and nickel. They are magnetic and look exactly like a mass of metallic iron; in fact when the "Delegate" meteorite was discovered near Delegate, New South Wales, by Mr. Alex. Pauline in 1913, one of the local explanations of the meteorite was that it was either a bag of bullock bells smelted together by a bush fire or a small blacksmith's anvil that had suffered the same fate. However, the want of homogeneity in composition is seen when a polished surface is treated with bromine or other suitable etching agent. Owing to the difference in solubility of the various constituent alloys, a regular pattern is etched on the surface and is known as a Widmanstätten figure.



A portion of the etched surface of the "Delegate" meteorite (siderite) showing Widmanstätten figures. This is reproduced direct from a contact print taken from the meteorite.

The second class of meteorite is known as the iron and stone meteorites, or Siderolites. As their name implies, they consist of a mixture of the nickel iron alloys and one or more of the silicate minerals. The "Molong" meteorite is a very interesting example of this class. It was found by Mr. John Williams on E. Farrell's farm on the Molong Creek, New South Wales, in August, 1912, and weighed sixty five and a half pounds. Exposed to the air it rapidly oxidises and crumbles away, and part of it is preserved in the Museum in a glass vat containing kerosene. It consists of rounded crystals of olivine occupying the interstices of a network of nickel iron alloy. The Sydney Technical College cut this meteorite into two portions, but owing to its hardness ordinary metal-cutting appliances were useless, and saw blades made of sheet copper fed with emery and carborundum were used ; in all it took 141 hours

to cut through. The great majority of the olivine has been fractured, but by careful examination the late W. H. Gilding was able to obtain a small piece of gem quality which he cut and polished. This gem is now preserved in the Mining and Geological Museum, Sydney.

The next class is represented by the stony meteorites or Aerolites, which consist essentially of silicate minerals such as pyroxene, olivine and felspar. There may be present a little nickel-iron alloy. A meteorite of this class was discovered by Mr. A. McCormack near Binda, New South Wales, on the 5th June, 1912. He was engaged in rabbit trapping when he noticed what he took for a newly-formed rabbit burrow ; on tracing the burrow to its termination he discovered the meteorite. It consisted of felspar, pyroxene, chromite and a little nickel-iron alloy. It is almost certain that this meteorite was seen to fall on the night of Saturday, 25th May of the same year, when a meteor was seen passing over Goulburn and Crookwell, and was accompanied by a loud noise which one resident mistook for a passing aeroplane.



Australites, a variety of Obsidianite, showing the characteristic shapes.

[ Photo — G. C. Clutton.

The fourth class is represented by the glassy meteorites or Obsidianites, which consist entirely of glass, and are invariably small in size. These very interesting objects occur in only a few very widely scattered localities—Australia, Bohemia and Malaysia. It has been suggested that these obsidianites are of volcanic origin, but they always occur in regions far removed from volcanic activity, and are now generally accepted as meteoric.

## A Dinosaur Exhibit.

BY THE EDITOR.

[This article describes some exceedingly interesting specimens which, through the good offices of Dr. W. K. Gregory, were obtained by exchange with the American Museum of Natural History, New York.]

THE rise and development of the successive faunas which have peopled the globe can be traced by a study of their fossil remains found embedded in the sedimentary rocks of the earth's crust. These rocks were at one time unconsolidated clay, sand, or mud, and in ages past, as to-day, the bodies of animals sometimes became buried in these deposits, and, as the loose sand and clay became hardened into sandstone and shale, the hard parts of these animals were converted into stone. Now in a quarry or rock cutting our curiosity is sometimes excited by the discovery of the petrified remains of some strange creature that lived and died, perhaps millions of years ago.

Thus the sedimentary rocks by their contained fossils furnish a record of the past history of life, the lowest rocks containing the most ancient fossils, and palaeontology, or the study of fossils, is the science which deciphers this wonderful record. Geological time is measured not in centuries but in millions of years, and the life of man and the whole duration of the human period, is such a short span that it is difficult for us to realise the vast period of time during which life has been evolving on our planet. Since its beginnings the earth has suffered many changes and majestic revolutions, and its living inhabitants as well have had a strange and eventful history. Race after race of animals and plants came into existence, had their day, then wholly or partly disappeared, to be replaced by others in accordance with the law that the fittest survive.

The latest chapter in this enthralling history we in our pride call the Age of Man, a comparatively short period

which stretches over no more, perhaps, than a few hundred thousand years. The preceding Cainozoic (recent life) or Tertiary period, which endured for millions of years, is commonly known as the Age of Mammals, for, during that time, there was a wonderful evolution of mammalian life, which reached its climax about the middle of Tertiary time and is now on the wane. The next oldest period is the Mesozoic (middle life) or Secondary, distinguished by a marvellous profusion and variety of reptilian forms, so that it has been called the Age of Reptiles. Below the Mesozoic lie the Palaeozoic (ancient life) sediments, in which the most abundant fossils are invertebrates, such as corals, molluscs, and crustaceans, though primitive fishes, amphibians, and reptiles are also represented. This is known as the Age of Invertebrates.

The Mesozoic period, which chiefly concerns us here, is divided into three sections, which, in order of decreasing age, are called the Triassic, Jurassic, and Cretaceous. All through this vast period of time, which lasted for at least twelve million and perhaps several hundred million years, reptiles were the lords of creation. Birds and mammals did exist, it is true, but they were apparently poor in numbers and organization, and presented but slight resemblance to the birds and mammals of the present day. The mammals, now the dominant race, were then small furtive creatures, mainly arboreal in habit; their nearest living relatives are probably the monotremes and marsupials, the characteristic mammals of our own Australia.

The reptiles of the Mesozoic period flourished amazingly in the absence of serious competition by other forms, and, as will always happen in nature under



similar conditions, they branched out in many directions in obedience to the law of Adaptive Radiation :o convincingly expounded by Dr. H. F. Osborn. Some were swift destructive flesh-eaters, preying upon their weaker fellows as the lion, the wolf, and other carnivores do to-day; others were vegetable feeders, comparable with modern hoofed mammals. Some, as the *Ichthyosaurus* and *Plesiosaurus*, became adapted to a marine life like our whales and porpoises; still others, the pterodactyls, took to themselves wings and flew through the air like birds.

But of all the reptiles of the period the dinosaurs were the most remarkable. Apparently they originated in the Triassic as lizard-like forms with long limbs and tails, having five toes on each foot armed with sharp claws. These ancestral forms were probably adapted to live on dry land, and their gait was more or less bipedal or kangaroo-like. This central type gave rise to a great variety of forms. Some were carnivorous, others herbivorous, some were gigantic, almost equalling modern whales in bulk, others were quite small, some walked on all fours, others on their hind legs; some were dwellers on the dry land, others wallowed in the waters of rivers and lakes like the hippopotamus. Many were provided with bony armour-plates or armed with formidable horns or spines; some had long sharp claws, others hoofs. In fact, in their time, the dinosaurs played much the same part as the larger mammals now inhabiting the earth. And the explanation is simply that in nature there are certain roles to be filled, and the actors are chosen by natural selection from the material available. As Dr. W. D. Matthew has well said, if birds and mammals were to be exterminated by some cataclysm, it is probable that existing lizards would, in the course of ages, evolve into a fauna not unlike the dinosaurs of old.

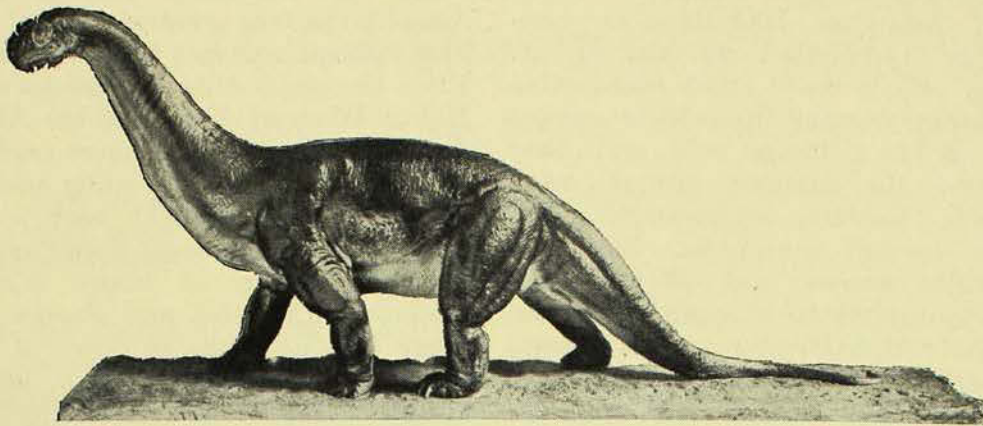
The remains of these land dragons have been found practically all over the world; even in Australia, which seems to have been a "lonely conti-

nent" for many ages, we find slight traces of dinosaurs. But it is in America that the greatest finds of these long extinct creatures have been made. From the great delta formations of the Middle Western States and the Alberta district of Canada, successive exploring parties sent out by the leading American museums have brought back a wonderful series of dinosaur bones, and the patient labours of many scientific workers in America and Europe have made the structure of some of these long dead creatures almost as well known to us as that of animals now living. We know even what their integument was like, through the fortunate circumstance that the mummified body of a dinosaur became embedded in fine sediment which took an impression of its skin.

#### THE AMPHIBIOUS DINOSAURS (SAUROPODA).

Dinosaurs are divided into groups according to their structure. The Sauropoda or Lizard-footed Dinosaurs were the largest of all, and *Diplodocus*, *Brontosaurus*, and *Brachiosaurus*, which belonged to this group, were much larger than any animal now living, with the exception of the largest whales. *Diplodocus*, for example, was over eighty feet long. As the Sauropoda are supposed to have lived partly on land and partly in water they are sometimes called the Amphibious Dinosaurs. All the members of this group were quadrupedal in gait. They had a very small head, blunt teeth, long neck and tail, a compact slab-sided body, and massive limbs terminating in five-toed feet. They lived during the late Jurassic and early Cretaceous, becoming extinct in the mid-Cretaceous period.

*Camarasaurus*, a smaller relation of *Diplodocus* and *Brontosaurus*, is represented in our collection by an original thigh bone five feet three inches in length and weighing 388 pounds in its petrified state, by a beautiful model, one-tenth natural size of the animal as it appeared when alive, and by a fine drawing of the skeleton. The model and drawing, both executed by the late

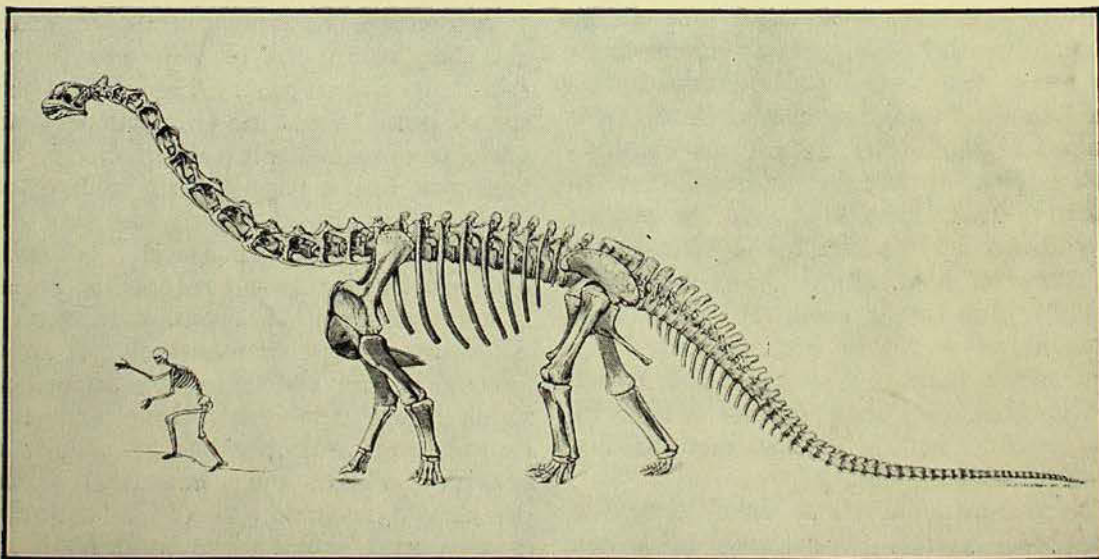


Model of the amphibious Dinosaur, *Camarasaurus*. It was fifty-two feet long and about twenty feet in height. Constructed by Erwin S. Christman, American Museum of Natural History.

[Photo.—G. C. Clutton.

Erwin S. Christman, whose early death was a signal loss both to art and science, are the outcome of fifteen years' research by President H. F. Osborn, Dr. W. K. Gregory, Dr. C. C. Mook, Erwin S. Christman of the American Museum of Natural History, and other experts. The pose of the skeleton was worked out in a miniature model with flexible joints, and the muscular restoration is based on a careful comparison with living reptiles. This reptile was fifty two feet in length and about twenty feet in height.

Its skeleton offers a striking example of adaptation to special needs. A body of such huge dimensions required an adequate scaffolding for its support and for attachment of the muscles which served for locomotion; the bony framework of *Camarasaurus* shows us how admirably the problem was solved. Its long neck demanded strong and firmly anchored muscles, and these required large surfaces of bone for their attachment, therefore we are not surprised to find that the neck vertebrae of the animal were of complicated design, hollowed out by lateral cavities



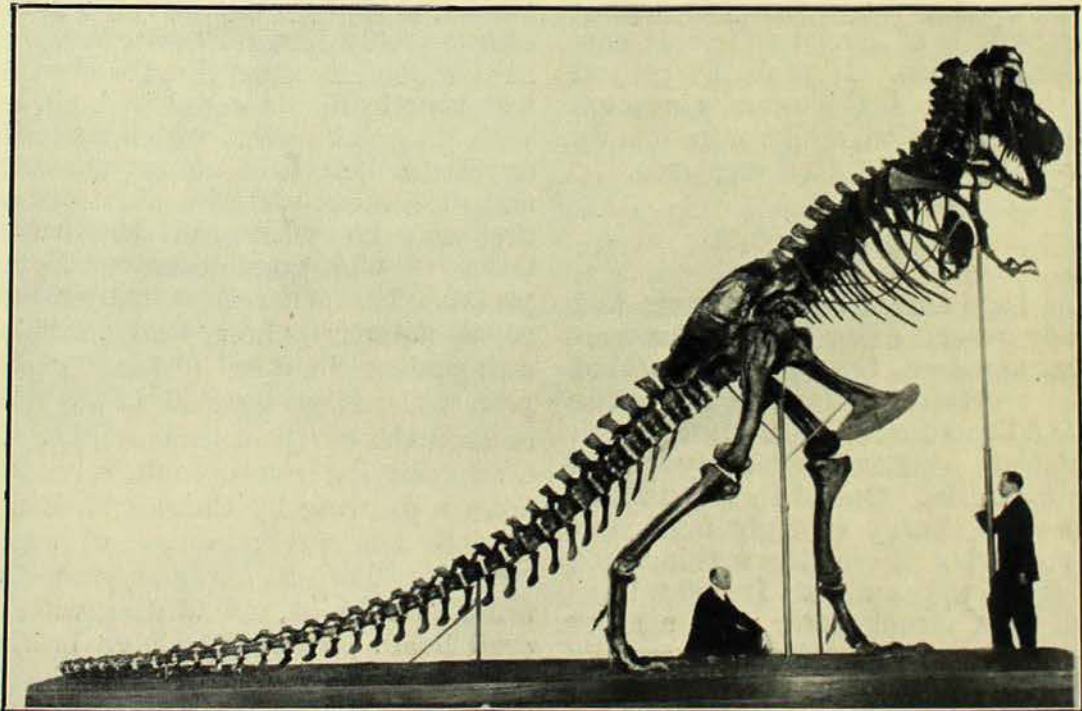
Skeleton of the amphibious Dinosaur, *Camarasaurus*, with human skeleton for comparison. From drawing by Erwin S. Christman.

[Courtesy of the American Museum of Natural History.

with numerous keels, buttresses, and struts, so as to combine the largest possible surface with minimum weight. The rest of the vertebral column shows the same features, but not in so pronounced a degree. The ribs and limb bones, on the contrary, were solid and heavy, which has suggested the view that these reptiles spent much of their time under water, wading about on the bottom of rivers or freshwater lagoons, their massive limb bones counteracting the buoyancy of their bodies, like the lead in a diver's equipment, while their giraffe-like necks enabled them to thrust their heads up from the depths like the periscope of a submarine, to renew their air supply and have a look round. From the structure of their teeth the conclusion is drawn that their food consisted of succulent vegetation such as grows in swamps and marshes. The amphibious dinosaurs had apparently no means of defence against possible enemies, unless they were able to use their long flexible tails as a sort of lash, and it is probable that they were accustomed to seek safety by retreating to the water. Some authors consider that they never came ashore at all, while others believe that they were wholly land animals. Who knows?

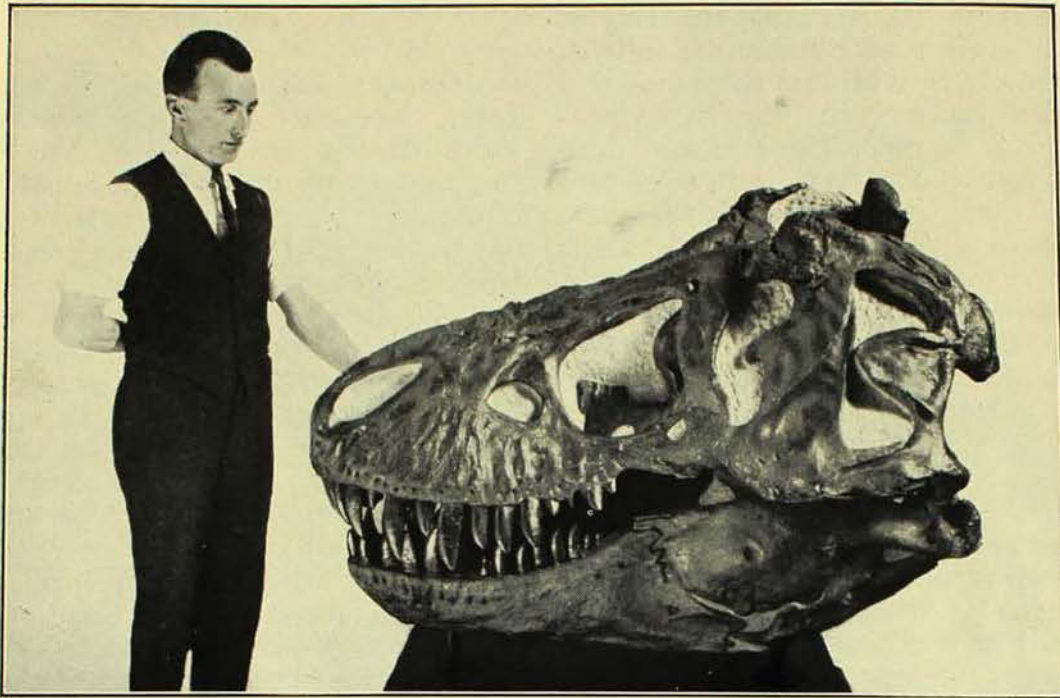
#### THE CARNIVOROUS DINOSAURS (THEROPODA).

Compared with the amphibious dinosaurs, the carnivorous types were much more diverse in structure and size. Some were no larger than a cat, and *Tyrannosaurus*, with its length of forty-seven feet, rivalled modern elephants in bulk. They were armed with numerous long sharp teeth and sharp curved claws, and their general structure indicates that they were active and formidable beasts of prey. In appearance they were a sort of cross between a bird and a lizard, with long hind legs on which they habitually walked, their long tail balancing the weight of their body; the fore legs in forms such as *Tyrannosaurus*, were almost ludicrously small in proportion, and quite inadequate to support the body of the animal. The skull cast of *Tyrannosaurus* shown in the case, and the photograph of the complete skeleton in association with the human figures, show that the reptiles, unlike the amphibious dinosaurs, had a large head, as we should expect in a predatory animal. Its brain, however, was small compared with that of a modern crocodile or lizard, and probably *Tyranno-*



Mounted Skeleton of *Tyrannosaurus* in the American Museum of Natural History. This reptile was forty-seven feet long, the largest flesh-eating land animal that ever lived.

[Courtesy of the American Museum of Natural History.]



Cast of the skull and lower jaw of *Tyrannosaurus*. Prepared at the American Museum of Natural History.

[Photo.—G. C. Clutton.]

*saurus* was not a subtle hunter, like the cat or the fox, but depended on brute strength and mass action to provide him with a meal. This gigantic reptile, the largest flesh-eating animal that ever walked the earth, lived in the Cretaceous times and was the culminating effort of evolution in this particular direction. It probably preyed on the giant herbivorous dinosaurs of the same period, which were mainly slow-moving, dull-witted creatures.

#### BEAKED DINOSAURS.

The huge amphibious dinosaurs had already passed away before *Tyrannosaurus* appeared, but there were other huge vegetable-feeding reptiles, the Beaked Dinosaurs or Predentata, which flourished contemporaneously with *Tyrannosaurus*. One of these was *Triceratops*, a clumsy strongly built reptile somewhat resembling a rhinoceros in size and appearance. It had a huge head, three strong horns, and a great bony crest or frill projecting from the back of its skull over its neck. The animal was quadrupedal, with short massive legs, terminating in hoofs, a

short thick tail, a stout body, and a short neck. Its muzzle was encased in a horny beak resembling that of a turtle, and its teeth had broad crowns, indicating that it chewed its food, instead of swallowing it whole as modern birds and reptiles do. Even *Tyrannosaurus* would find no mean antagonist in this ponderous reptile, for the latter was practically its equal in bulk, and, with its great horns, which sometimes reached a length of almost three feet, and its armour-plated neck, it was well designed to withstand the rushing onset of the great carnivore. It is probable that there was many a battle royal between these two formidable antagonists in the distant geologic past, when these dragons of the prime stalked the earth in their might. The accompanying photograph, reproduced from a drawing by Charles R. Knight, depicts the preliminaries of such a combat. The *Triceratops*, male and female no doubt, are waiting with lowered head, prepared to give battle to the advancing *Tyrannosaurus*, while their young one seeks safety by pushing close to its bulky parent.



The giant carnivorous Dinosaur, Tyrannosaurus, approaching Triceratops, a herbivorous relative on which it probably preyed. From a drawing by C. R. Knight.

[Courtesy of the American Museum of Natural History.]

#### EXTINCTION OF DINOSAURS.

Many suggestions have been made to account for the extinction of these reptiles, which seem to have been built to endure for all time, but it is always difficult to discover the causes of extinction of organic types. Looking down the great vista of the past we are apt to think that the dinosaurs evolved, reached their culmination, and then suddenly died out. But in reality the process was one of extreme slowness, spread over millions of years, and, once we realise that important fact, we cease to wonder at their disappearance. The great American naturalist, Cope, suggested that the small cunning mammals, which had already made their appearance before the Age of Reptiles drew to its close, would seek out and eat the eggs of their formidable contemporaries. A more plausible explan-

ation is that great geographical changes took place, the swamps necessary for some kinds of dinosaurs were drained by elevation of the land, aridity increased and the climate grew more severe. Reptiles as a class are more susceptible than birds or mammals to changes of temperature, for they are cold-blooded and have no covering of feathers or hair to protect them against cold. Then, too, the large size and over specialization of many dinosaurs handicapped them for life's race. A large animal requires more food than a small one, and any considerable alteration in environment is fatal to a creature which has become specially adapted to live in a certain way and cannot adjust itself quickly enough to changed conditions. Palaeontology is continually enforcing the lesson that large size and extreme specialization almost always presage extinction.

Professor T. Thomson Flynn, University of Tasmania, Hobart, is at present carrying on certain investigations relating to the internal organs of the Blue Tongue or Sleeping Lizards, a large well-known species belonging to the genus *Tiliqua*. As a large number of

specimens is required, readers would be rendering a great service by sending any they may secure to the Australian Museum. It does not matter whether they be alive or dead so long as the abdominal organs are intact and uninjured.

## The Pan-Pacific Science Congress.

The recent meeting of the Pan-Pacific Science Congress was the most important scientific gathering that has taken place in Australia since the British Association for the Advancement of Science met here in 1914. Australia is so far removed from the great centres of scientific activity, and the scientific workers are so few that even a short sojourn in our midst of the leaders of research in neighbouring countries is bound to have a stimulating effect.

The Pacific Ocean and the lands bordering upon it present many unsolved problems which can best be attacked by co-operation. Some of the problems have no immediate economic bearing but others are closely concerned with the material well-being and happiness of the peoples, white or coloured, inhabiting Pacific lands. Such questions as irrigation, diseases of farm crops and farm animals, the ravages of the prickly pear and the blow-fly, the distribution of insects in relation to disease, are of vital importance

to us, and others such as the decline in native population, the evolution of plant life in the Pacific, the origin and structure of coral reefs, the physiographic unity of the Pacific, are of absorbing interest, not merely to scientific men but to all. Most important of all perhaps is the bringing together of chosen representatives of the various Pacific countries to discuss questions of common interest, which cannot fail to promote that feeling of international brotherhood which the world so much needs. To quote the noble words of His Excellency the late Sir Walter Davidson, in the inaugural address of the Sydney session.

"Always in the deep recesses of our hearts we wonder, nay we hope, and indeed we believe, that meetings such as ours will exorcise the demons of jealousy and unrest, and lay them in a limbo with the brutalities and follies of the past. Nationhood and pride of race is a glory only so long as its inspiration is actuated by peace on earth and goodwill among men."

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## Lecture Notes.

On September 14th, Mr. J. R. Kinghorn, under the auspices of the Teachers' Federation, Goulburn, delivered a Museum Extension Lecture entitled our "Feathered Friends." There have been several of these lectures delivered at this centre, and the proof of their popularity is shown by the consistently good attendance at them.

The extension lectures were founded in the interests of those, who, by reason of distance, are unable to attend the series delivered in the Museum. The services of the lecturer are provided by the Museum, but it is expected that local residents will make arrangements for the hall, lantern, and generally do their part to make the scheme a success.

On September 20th, Mr. W. H. Thorpe lectured to the students of the Presbyterian Ladies' College, Croydon, utilising the College ethnological collection to illustrate his remarks.

Prof. E. Cossar Ewart, M.D., F.R.S., of the University of Edinburgh, on September 25th, lectured on "Feathers and the Hatching of King Penguin."

Further lectures will be delivered in the Museum lecture theatre on the following dates at 8 p.m. Admission is free.

October 11th — "Bats and their Habits," by Mr. E. L. Troughton.

November 8th — "A Naturalist on the Nepean River," by Mr. A. Musgrave.