The AUSTRALIAN MUSEUM MAGAZINE

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

PROFUSELY ILLUSTRATED.

Vol. 1. No. 9. JULY, 1923. Price—ONE SHILLING.

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COLLEGE STREET, SYDNEY.

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[Photo.—*G. C. Clutton.*

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Published by the Australian Museum - - - College Street, Sydney

Editor: C. ANDERSON, M.A., D.Sc. Annual Subscription, Post Free, 4/4.

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Editorial.

THE AUSTRALIAN MUSEUM BUILDINGS.

IN planning a museum it is difficult to foresee what the future needs of the institution may be so that adequate provision may be made for expansion and evolution. In the case of our own Museum the intention at one time was to erect a building which should be at once a Library, an Art Gallery and a Museum. This intention was abandoned, but, though the Library and Art Gallery now have their own buildings, the original plan has been adhered to more or less in the additions that have since been made to the nucleus of the building erected in 1849.

As generally happens building has not kept pace with the expansion in the collections housed in the Australian Museum, and now an extension of the existing buildings is urgently required. Extra space is needed for exhibition purposes, for storage of specimens, for the library, for work rooms.

To the public the exhibition halls are the Museum, and it is quite proper that in a state-owned museum the education and entertainment of the public should be one of the first duties of the management. To every museum there comes a time when the exhibition galleries are filled to their utmost capacity and no new exhibits can be introduced without displacing others. Up to a certain point this is no disadvantage, for few exhibits are so good that they cannot be replaced by better. But the process cannot go on indefinitely, for at last the stage is reached when it is no longer possible to withdraw exhibits without seriously impairing the usefulness of the museum. In the Australian Museum we have now reached that stage. For example we have a large and valuable collection illustrating the ethnography of the Pacific Islands, but only New Guinea, the Solomons and Bismarck Archipelago are adequately represented in the ethnographical galleries. The large and interesting collections from the other island groups, comprising practically the whole of Polynesia and Micronesia, are mostly packed away where the public have no opportunity of seeing them.

In the department of zoology the most striking and most instructive exhibits are habitat groups, showing the animals in their natural surroundings, as in the case of the coral pool and the Admiralty Islets bird group described in this number. But to show these effectively considerable space is necessary and to make room for them other exhibits, themselves

of great interest to the public, must be sacrificed.

Like many other museums ours has suffered from the failure to make adequate provision for the storing, as distinguished from the exhibiting, of specimens. Storage is just as important as exhibition, if the museum is to be not only a repository for natural history or other objects but also a research institution. Large series of specimens are necessary for study and comparison, and these should be housed in a safe place where they are readily accessible. In the Australian Museum the reserve and reference collections are for the most part accommodated in darksome basements or in unsightly galvanized-iron sheds, which on account of the large amount of wood used in their construction are badly infected with white ant and also liable to fire risk. This should not be, and, when an extension of the building is planned, adequate and suitable provision for storage should be made.

An important adjunct to a museum is its library and this constantly increases in volume. Our library contains a very valuable collection of scientific books and journals, and specialists in other States and even in New Zealand, who find it necessary to consult works otherwise beyond their reach, frequently appeal to us for help. But the library of the Australian Museum has outgrown the space assigned to it and has overflowed into corridors and into a basement which is not at all suitable for the safe custody of books. This entails considerable inconvenience and waste of valuable time. Moreover the library lacks a reading room, where those, members of the staff or others, who wish to consult its treasures may do so in comfort.

The Lecture Hall has fulfilled a useful purpose. Our lectures have become so popular and well attended that as a general rule the accommodation is inadequate, and more than once a large number of people have been unable to obtain even standing room. If a larger hall were provided the present one could be converted to other uses or reserved for special smaller audience.

The State Government has in the past extended a generous measure of support to the Australian Museum, in which a large amount of capital is now, in a manner, invested. To get the fullest return from this capital an extension of the buildings is now essential.

By the death of Mr. G. McRae, Trustee, the Museum has suffered a distinct loss. Mr. McRae, who only recently retired from the position of Government Architect, had been associated with this institution since May, 1921, and his professional advice and assistance was at all times highly esteemed by his co-Trustees.

During the past year the Gallery Collection of Insects has been subject to much revision and alteration. A new departure from the old system has been the placing of labels at the head of each order and family giving a brief résumé of their characters. This, it is hoped, will assist in the elucidation of insects, enabling the tyro to at once identify his material.

The great changes which specialists are to-day making in the old nomenclature has necessitated the re-naming of many old insect friends, therefore, in labelling the species the better known name has been placed as a synonym beneath the correct name.

The Australian insects may still be found in the wall cases, with the exception of the beetles, which have been placed in the table cases over-looking the Fossil Gallery.

Some of the groups are still under revision, which accounts for any bare panels that may be seen in the cases.

Two New Museum Groups.

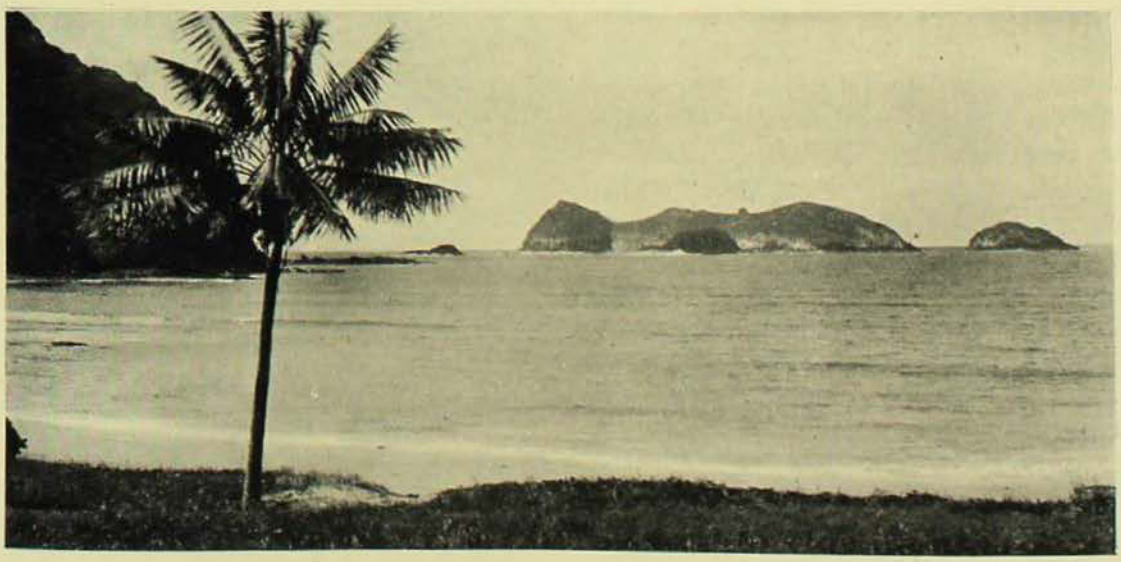
By Allan R. McCulloch.

(A generous joint subscription of the necessary funds by Messrs. A. E. and O. Phillips, Sir Hugh Dixson, Mr. William Dixson, and Sir James Burns, enabled the Trustees to despatch a party from the Museum to Lord Howe Island, with the object of procuring material for the construction of three group exhibits in the Museum galleries. One of these has already been described in The Australian Museum Magazine, and the following are notes describing the natural conditions which we have endeavoured to represent in the other two.—*Editor.*)

A Nesting Colony of Sea Birds on the Admiralty Rocks at Lord Howe Island.

SEA Birds wander far and wide over the oceans during the greater part of the year, but, at the call of the mating season, they foregather at chosen places to nest and rear their young. The colonies thus formed often include countless thousands of individuals, and may be comprised of either a single species or of several different kinds. There is reason to believe that many birds repair to the same places year after year, regardless of the great distances they may have travelled between whiles, and it is probable that young birds return to the islands upon which they were reared when the time comes for them to undertake the responsibilities of parenthood.

The Admiralty Rocks at Lord Howe Island are a group of islets of fantastic form, with a scanty growth of grass and occasional low bushes upon their rocky faces. They are difficult of access except in very calm weather, and are favoured accordingly by many sea-birds as nesting sites. Early in December each year thousands upon thousands of Wideawake Terns (*Onychoprion fuliginosa*) wend their way in from the sea, and, meeting with their fellows, chatter loudly as they select favoured positions. Not that any one site would appear to be better than the



The Admiralty Islets lie off Ned's Beach, Lord Howe Island.

The Reef at Lord Howe Island encloses a broad shallow lagoon.

[Photo.—*A. R. McCulloch.*

others, because, as no actual nest is built, any surface flat enough to rest the egg upon seems to be all that is required. As the month goes by the terns become more and more numerous, and, when the chickens make their appearance, the ground is covered with a living mass. Walking among them, one must tread warily to avoid crushing a young bird or an egg under foot, while clouds of their distracted parents fly close above one's head, screaming and chattering, and occasionally swooping down to peck at the intruder.

The egg of the Wideawake is excellent eating, and, though the yolk is richly coloured, it lacks that fishy flavour which is common to most sea-bird's eggs. Great quantities of them are collected for the table by the residents of the island during the early part of each season, but, as each bird robbed of its egg soon lays another, the numbers are not diminished. The eggs are beautifully mottled and blotched with brown, and no two appear exactly alike. Maybe each bird recognises its own by the marking upon it, though experiments have shown that its position is largely the parent's guiding feature. What happens when a crowd of similarly marked chicks are disturbed by some intruder can only be left to the imagination, for they scramble off in every direction and become hopelessly confused as they jostle and tumble over one another in their frantic efforts to hide.

The chickens develop rapidly, changing from little balls of fluffy down to fledglings with a sooty black plumage speckled with white. When they are ready to fly their parents encourage them seaward and introduce them to the stern realities of their future lives. They are taught the art of fishing and of battling with adverse winds and waves. But they return to their rocky homes at nightfall, and one hears them high overhead as they struggle with youthful effort against the fresh breeze, their shrill cries being ever answered by the rolling notes of their guardians calling "Wideawake Wideawake" as they guide them in from the sea.

Gannets (*Sula cyanops*) are also plentiful on the Admiralties, their bulky white forms being everywhere conspicuous from afar. Their large white eggs are deposited upon bare rock, and, though always dirty, are white upon their outer surfaces; if scratched, however, the inner layers of the shell are shown to be pale green in colour. At sea gannets are particularly powerful birds, flying with ease and speed, and often diving headlong from considerable heights upon some luckless prey; but on land they are ungainly in the extreme, and if disturbed are apt to trample cruelly upon their offspring in their confusion. They are armed with powerful beaks and occasionally show fight when approached, while squawking harshly at the intruder. But, as though well aware of their awkwardness, they more often vomit up half-digested fish which they leave as spoils to the victor, and, deserting their hapless chickens to fate in a most cowardly manner, make their escape at the first opportunity. Their wings are so long, however, as to beat upon the ground if the birds attempt to arise from a flat surface, so they must reach a ledge or slope before they can take off into the air.

When first hatched, gannet chicks are sprawling, naked, and remarkably ugly objects, but by dint of much feeding they grow apace, and soon rival their bulky parents in size, even while covered with fluffy white down. Grey feathers then make their appear-

ance, which develop into a speckled plumage strangely different to the black and snowy white of their parents, as is the fashion among sea birds.

The few scattered bushes growing upon the rocky islets are tenanted by graceful grey-capped Noddies (*Anous stolidus*), which construct crude nests of grass among their branches. Mutton birds (*Puffinus pacificus*) scoop out shallow burrows where they can find sufficient soil, or secrete themselves among grass tussocks and in holes among rocks. The parents share the duties of incubating the eggs and of keeping their ever hungry babies supplied with food, and upon the sea around the islets one sees long black ribbons which are composed of thousands of the adults fishing together around a shoal of fish or some other massed marine life. Shelves upon the cliffs serve the graceful little Blue-billies (*Procelsterna caerulea*) as nesting places, the more inaccessible their position the greater their favour with the birds.

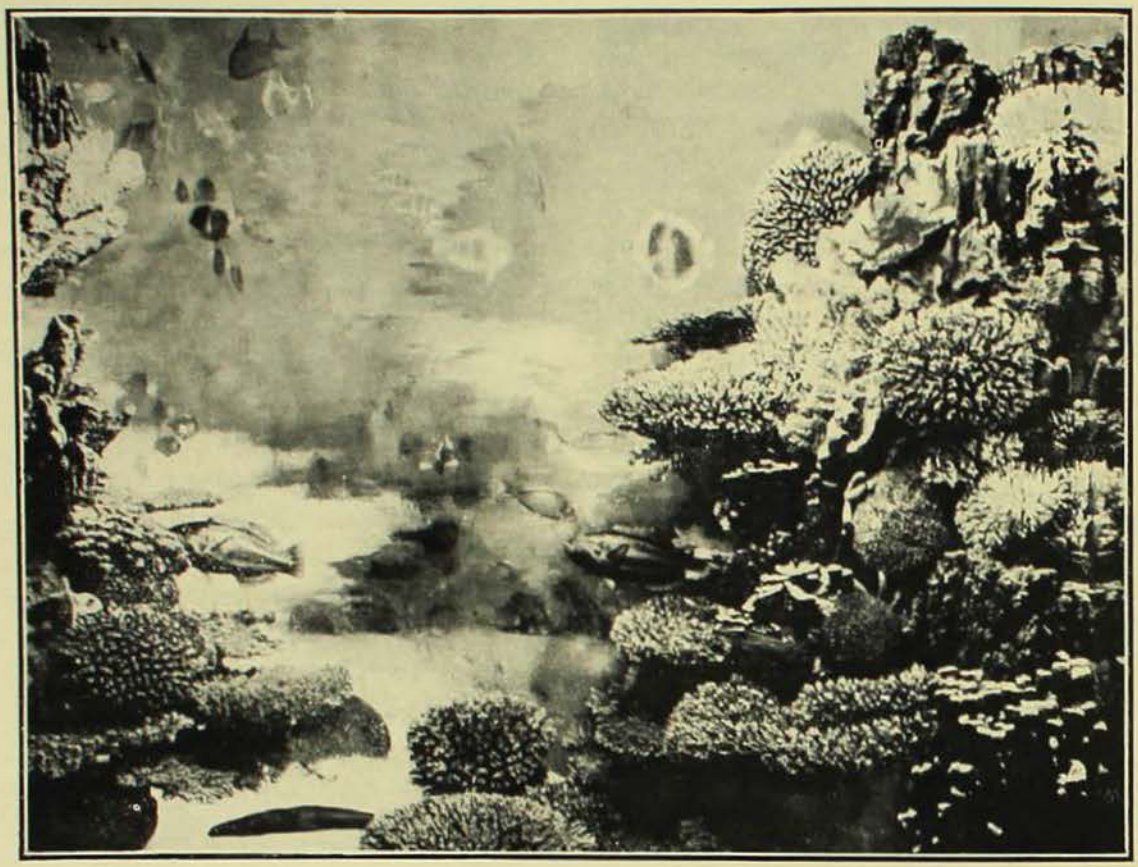
The group illustrated in the frontispiece of this issue is a recent addition to the Museum galleries, and represents a corner of a nesting colony of seabirds on the Admiralty Islets. Representatives of the five species are assembled just as they occurred under natural conditions, chicks and fledglings being mounted in life-like attitudes with their parents. A vivaciously painted back-cloth picturises the turbulent seas encompassing the rocks, with Lord Howe Island in the background, and the whole is carefully copied from photographs of an actual scene, and will doubtless interest and instruct visitors to the Museum. The construction of the exhibit is the work of Messrs. H. Grant, J. H. Wright, and W. Barnes, of the Museum staff, while the back-cloth was painted by Mr. H. R. Gallop.

A Coral Pool.

The Great Barrier Reef of Australia, extending for twelve hundred miles along the coast of Queensland, is the greatest coral formation in the world. It forms the western boundary of the Coral Sea, which is beset with many atolls and coral-banks, most numerous towards the equator, and becoming more scattered as they approach cooler waters. The southernmost reef fringes the shores of Lord Howe Island, which lies eastward of Port Macquarie, New South Wales, and only about one hundred and seventy miles northward of Sydney.

A number of widely different animals are commonly recognised as corals, among which the precious Red Coral, *Corallium*, and the white bleached skeletons of the Stony Corals of the order Madreporaria, are best known. The latter are the reef builders, and secrete hard stony skeletons, although their bodies are only of the consistency of thin jelly. The coral polyps or "insects," as they are usually but very erroneously called, can thrive only in the open sea where the water is crystal clear and far removed from the influence of mud. When expanded they resemble tiny flowers, with petals radiating around a central opening, and their colours often vie with those of a luxuriant garden. But the similarity ends there, for they are not plants but true animals. They are able to extract lime from sea-water and thus they secrete around themselves a hard stony skeleton, which protects their soft bodies from the battering effects of the waves.

There are a great number of different kinds of Stony Corals, each of which has its own type of skeleton, some being so massive and solid that they can scarcely be chipped with a hammer, while others are so brittle that their branches snap at the slightest touch. Some grow best where the surf breaks heavily upon them, flourishing under



A coral pool, reconstructed from material collected at Lord Howe Island.
[Photo.—*G. C. Clutton*.

conditions which destroy the most powerful works man may devise. Others prefer less turbulent waters, and thrive in the shelter of their more hardy fellows.

In their living state all are more or less coloured, but they are better known to most people by their limy skeletons, bleached snowy white upon a mantel shelf.

The regions where coral-reefs occur support a much greater wealth of life than is to be found anywhere else. Myriads of minute organisms abound in their vicinity and form the main food supply of a host of larger animals such as crabs, shell-fish, worms and echinoderms. These in their turn are preyed upon by an endless variety of fishes, which teem in the holes and channels of the reef edge and patrol the neighbourhood in search of food. Such sand as occurs consists solely of the triturated remains of reef animals, and not infrequently almost every grain is a more or less eroded shell of a tiny creature called *Tinoporus*. This, a mere speck of jelly, lives upon seaweeds, often in such numbers as to cover them entirely. They also extract lime from the sea, and secrete it around themselves as hard star-shaped tests ; when the animals die these fall to the bottom, filling up holes and cracks between the corals and adding largely to the final solidity of the reef. Their jelly substance, and that of allied and even more minute animalculae, is eagerly sought by star-fish, sea urchins, and beche-de-mer which creep among the crevices in the coral ever engulfing sand, which passes through their long intestines while the animal matter is sorted out and assimilated,

A recently constructed exhibit in the Museum attempts to show something of the beauty and abundance of life upon a coral reef. The visitor is supposed to be beneath the water, looking through the glass into a pool formed of growing corals as one would look into an aquarium. All the rock is covered with coral growths of many different kinds and colours, which branch and creep over one another like

Bringing the coral ashore.
[Photo.—*A. R. McCulloch.*

plants in a tropical jungle, each endeavouring to secure as much food as possible and crowding out its neighbour. Brilliant green and brown *Madrepores* spread their innumerable fronds outward in the form of flat shelves, while dark coloured and massive *Porites* reach upward in pillar form, their tips brightly tinted with blue or yellow. Stocks of *Pocillopora*, variously tinted with carmine, lemon-green, or salmon pink, add colour to the duller brown creeping madrepores which form the greater mass of the solid structure. White coral-sand covers the floor of the pool, upon which some black slug-like beche-de-mer are creeping, while orange starfishes and spiny sea urchins secrete themselves among the coral branches. Brilliantly coloured fish are also shown in the pool.

All the specimens used in the construction of this exhibit were collected on the reef at Lord Howe Island, with no small amount of labour and difficulty. Most of the corals desired occurred only in crevices on the outer edge of the reef, and could be approached only on calm days and when the tide was at its lowest. Living corals cannot bear exposure to the air, so our quarry had to be searched for in the deeper holes, which were submerged at even the lowest spring tides.

A small party manoeuvred a flat-bottomed dinghy over the shallows, and, by means of water-glasses, peered down through the water in search of suitable corals. They were in plenty, but generally in such positions as made them too difficult to procure. Upon finding some likely looking pieces several of the party dived overboard and, with the aid of swim-glasses which enable one to see clearly under water, endeavoured to detach and bring them to the surface. They were unusually firmly secured, however, and much diving with crow-bars, cold-chisels and hammers, was necessary before they could be loosened. And it is not easy to manipulate such tools beneath the water while holding one's breath till almost at bursting point and at the same time fighting the constant tendency to float upward. So, with feet waving above our heads, and ever swimming downward, we struggled and tussled with the refractory bits until they were loose, to be either carried up to the boat in one's hands, or, if too heavy for this, to be hoisted inboard with ropes.

One needs leather gloves and heavy boots to protect hands and feet from severe scratches and cuts which are inflicted by the jagged coral whenever it comes into contact with naked flesh. Further, the slimy animal matter of the living polyps readily inflames any such wounds, so all precautions must be taken to minimise the inevitable injuries. At the slightest touch, the long needle-like spines of sea urchins projecting from unexpected crannies penetrate far into one's flesh from

The corals were bleached by burying them in the sandy beach between tide-marks.
[Photo.—*A. R. McCulloch.*

which they can be extracted only with difficulty. To plunge one's hand into a mass of these, as happened to one of us, is therefore a serious matter, resulting in severe inflammation and poisoning for a long period afterwards. Reef eels live among the coral, ready to snap at an offending hand thrust near them, and octopi with their nasty suckers, while thoughts of sharks sometimes flash through one's mind when swimming in deeper water.

With our dinghy laden, sometimes so heavily that some of the party had to swim ashore, we carried our gatherings to the beach. Here the corals were bleached by the simple process of burying them in the sand between tide levels. A few days sufficed to kill the polyps and macerate the animal matter, leaving their skeletons more or less clean and white. Fragile and special specimens were boiled in a tub with soda, which speedily removed the slime and left them snowy white. Samples of each were then recoloured with oil paints from living specimens on the reef, while many coloured sketches of fishes and other animals were prepared from living specimens to ensure accuracy in the reconstructed exhibit.

The construction of the exhibit is the work of Messrs. G. C. Clutton and J. Kingsley of the museum staff.

The Mammals of South Australia, Part I., containing the Monotremes and the Carnivorous Marsupials. By FREDERICK WOOD JONES, D.Sc. (*Handbooks of the Flora and Fauna of South Australia*), issued by the British Science Guild (South Australian Branch), Adelaide, Government Printer, 1923; price four shillings.

Although this work professedly deals with the mammals of South Australia only, it is a fine contribution to Australian mammalogy, and will be of the greatest value to zoologists in general. The gifted author has dealt with his subject in a thoroughly scientific manner, and the treatment is so fresh and original that one returns to the work again and again and always with renewed delight; the non-scientific reader too, will be able to peruse it with pleasure and profit.

The handbook is divided into a general part, wherein, after defining a mammal, a restrained and readable account is given of external features, some anatomical details and the classification of mammals, followed by a section dealing with some special problems connected with the mammalian fauna of Australia. Then comes a special part dealing with the Monotremes and Marsupials respectively, describing the various genera and species in detail. A useful feature is the series of simple keys by which the genera and species may be identified. Perhaps the most interesting sections are those in which are discussed the distribution and part history of the Marsupials (which the author prefers to call Didelphia), their place in the mammalian world, and their classification. Professor Wood Jones will probably find that not all zoologists will agree with him at all points. He favours the view that the marsupials entered Australia from the north by way of the Malayan chain, rather than from the south by way of the Antarctic continent, which latter is the view preferred by many. Again his classification of the marsupials by their foot structure into Syndactyla and Didactyla, rather than by their dentition into Diprotodonts and Polyprotodonts, will not meet with acceptance from everyone. The author has certainly made out a very strong case, which can be demolished only by very sound arguments.

The Recent Archaeological Discovery in Egypt.

By Ernest Wunderlich, F.R.A.S.

NO event of recent times has so fired the public imagination as the discovery of Tutankhamen's tomb and storehouse in the Valley of the Kings at Thebes. Indeed it has become a craze. Newspapers which had never before devoted an inch of their space to such subjects have taken it up. From the commotion made one would fancy that Egyptology was quite a new thing; and yet the only extraordinary part of this discovery is the fuss that has been made of it. After all, it is only an episode in forty years of systematic excavation; only one of a long series of similar discoveries. However, this extensive publicity has had the effect of drawing attention to archaeology and in particular to the important bearing Egypt has had on our present civilisation. A sign that the general public is taking a greater interest in such matters is evident from the large audiences that attended Professor Flinders Petrie's lantern lectures on "Royal Burials" recently held in London.

Who was Tutankhamen? Shorn of "ankh" and "amen," which are mere titles, and mean respectively "to whom long life" and "beloved of Amen" (the deity of Thebes), the name condenses to Tutu. He may or may not have been of royal descent. It is believed he was the natural son of Amenhotep III., the great Emperor-King, and his chief claim to fame is having married the daughter of Amenhotep IV. (or Akhenaten) the legitimate son of that Monarch. Akhenaten was the religious idealist and reformer, whose lofty ideas were in advance of the time and who, in endeavouring to stop war, lost the greater part of Egypt's Empire. On his death Tutu claimed the throne as Tutankhaten, but repudiated the idealistic doctrines of his predecessor, and, changing his name to Tutankhamen, became a pliable tool of the all powerful Theban hierarchy of Amen.

Tutankhamen has come into the limelight. He is the craze of the hour. But the glamour is undeserved. Little is known of his reign, and the very objects found in his tomb were probably never his. His illustrious ancestors pass unnoticed: Akhenaten, the prince of peace, who preached the religion of love and suffered the most pathetic disappointments; Amenhotep III. the serene monarch, during whose long and untroubled reign Egypt reached the zenith of its power and expansion of peaceful enterprise, arts and commerce; Thotmes III., the great warrior, conqueror, and builder of the Empire that Akhenaten again lost. And yet the lives of these and of many other kingly figures of a remote past are as accessible to anyone interested as the history of the Middle Ages, thanks to the patient labours of men of science. But it must be regretfully admitted that the vast literature on ancient Egypt is read only by a very limited public who look a little beyond the routine, fads and fancies of the day.

Few realise the extent of research since Champollion, working on Dr. Young's clue, first found the key to hierogylphics just a hundred years ago, and in deciphering the Rosetta Stone established exact data upon which science has since built. What great men have worked in this field since then, most of them without, or almost without pay, purely for science's sake. To mention a few: Lepsius, Brugsch, Mariette, Maspero, Naville, Bunsen, De Rouge, Wallis Budge, Flinders Petrie.

So exact are the data in this field of research that we know more about the private life of the ancient Egyptian than we do about the Greek or Roman.

It must be asked what use it is to know all this. But archaeology, or

the inner history of mankind, is part of nature's history. By tracing to its source the mental ancestry of man, it shows that our thoughts, habits, and institutions are the outcome of ancient civilisations. And these, in many respects were higher than ours, both in mechanical and intellectual achievement. It proves, moreover, that civilisation itself is an intermittent phenomenon, reaches its culmination, then declines and perishes, pointing to the ultimate fate of our own.

The late Lord Carnarvon's find is by no means the first sensational discovery made in Egypt. It is merely a confirmation of Maspero's prognostications and the completion of work commenced by Davis. These prepared the way, and Mr. Howard Carter's perseverance and luck did the rest. In 1881, at Deir-el-Bahari, were found the many royal mummies now in the Cairo Museum. It was a veritable hypogeum of Pharoahs. In 1888, at Tel-el-Amarna on the ruins of Akhenaten's capital, were unearthed hundreds of terra-cotta tablets on which were recorded in cuneiform language the diplomatic correspondence between the courts of Egypt and Babylon about 1440 B.C., a discovery throwing a flood of new light on the two cradles of civilisation, the valleys of the Nile and the Euphrates. But these and many other epoch-making discoveries did not create the stir this latest and lesser one has caused. What perhaps gives a unique cachet to the Carnarvon find is its richness, and the prevalence of so many unusual objects never before dug up in Egypt, also the excellence of their workmanship. But most of these objects of gorgeous oriental splendour do not come up to the simpler and nobler art standards of the classic age of Egypt. They are entirely foreign, being importations from Mesopotamia, with which country Tutankhamen's father in-law and (probably) half brother, Akhenaten, and before him Amenhotep III., had many dealings, as the Tel-el-Amarna tablets show.

I cannot do better than quote Professor Flinders Petrie's comments (*Ancient Egypt*, 1922, pt. IV.) on the objects brought to light.

A most interesting historical link is seen in the strange animal-headed couches. The cow-head couch has spotting inlaid on it of a trefoil form ; this is foreign to Egypt, but is well known in Mesopotamia, as on the couchant bull in the Louvre. The weird dog-head of another couch is also entirely un-Egyptian. Now, as Kallimasin, king of Babylonia, sent to Amenhetep III a couch of *ushu* wood, ivory and gold, with three couches and six thrones of *ushu* wood and gold, it is certain that there were Babylonian couches in the Theban palace ; and this description of ivory and gold refers to the dog head with ivory teeth and tongue, while the other couches are of wood and gold only. Later than Amenhetep III, Syria was too much disturbed, and Egyptian prestige in Mesopotamia was too slight, for such presents to be sent. They must be as old as Amenhetep III, and there seems no doubt that these are the very furniture described in the Amarna letter. In accordance with this, we find that each was constructed in four parts, with bronze jointing to fit together. Furniture made in Egypt is naturally all united in one, with fixed joints. But for a rough land journey of over a thousand miles, it was needful to make couches with separate sides, frame and base, in order to pack and transport them.

No doubt there was an imitation of Egyptian motives, as in the Hathor cow-heads, and the tails copied from lion couches. This only shows that they were made for presents to Egypt, and not that they were the work of foreigners in Egypt, because there would be no purpose in the elaborate bronze jointing, instead of solid joints. This detail would not be necessary if they were merely moved about the palace or put on a Nile boat. We see then, for the first time, court furniture of Babylon, and it will be of great interest to examine the technical details of the construction and compare it with Egyptian work. The short form of the couches shows that the Babylonian slept contracted, like the prehistoric people, while the Egyptian couches are all full length.

If some articles were thus of a previous generation, it is very likely that others were likewise old ; and the footstool, with nine foreigners under it, may well be that used by Amenhetep II as figured a century before. On the death of Tut·onkh·amen, who was the last legitimate king of the great family, it seems that the palace furniture was largely buried with him, as there was no heir to inherit.

Of all the Egyptian work the most informing to us will be the dress and personal detail. The colour weaving, the attachment of ornament, the construction of jewellery, will show much that is new to us. The glove has astonished people, but, as Miss Murray observes, gloves are figured in scenes, both among offerings and also worn.

The immediately urgent matter is that all these things should be preserved in the dry air of Qurneh, and not taken to the winter fogs of riverside Cairo. A large new

building must be provided in any case, as the Cairo Museum is far too full to take in properly all the objects which are piled up in four chambers of the tomb. The obvious site is Qurneh, somewhere south of Deir el Bahri. There a substantial museum should be built, without any upper floor, and entirely lighted from the north. Then will come the question of the efficient publication of all this mass of objects. The Egyptian Government should begin by an appropriation of £30,000 for the museum and £20,000 for publication. They cannot grudge a few *per cent.* of the value of what has been found for them, if they get everything for nothing. No one can hope that these things will last for another three thousand years ; probably this sheen of gold will perish by ignorant greed within three hundred years. A complete photographic and coloured reproduction of every object from various points of view, and with full diagrams of details, is the least that this generation owes to the past, which has guarded its treasure till now.

Circumstances which caused the death of a White Cockatoo (*Cacatua galerita*) in July of last year were probably unique. The bird had apparently escaped from captivity and was enjoying its recovered freedom in the vicinity of Maroubra, New South Wales. For some months it had been observed flying along the coast, and often venturing some distance seawards. During one of these excursions, and when within fifty yards of the shore, the cockatoo was attacked by two Silver Gulls (*Larus novae-hollandiae*) who, in the quarrelsome mood common to sea-birds, resented the trespassing of this clumsy stranger into their domain. The gulls being more than a match for the cockatoo in their better wing control and swifter flight, the short conflict that followed was a one-sided affair, and it was not many seconds before they had driven their still fighting antagonist into the sea from a height of one hundred feet. Despite its experience in this unfamiliar element the cockatoo managed to keep afloat, and flapping its outstretched wings grotesquely valiantly struck out for the rocky shore. Relieved now of the attentions of the harassing gulls, the bird made good its escape, but, on reaching shallow water, was caught up by several large white rollers which completely enveloped it for several seconds. Eventually it was carried close enough inshore to be assisted out of the water with the aid of a landing net requisitioned for the purpose from some fishermen nearby, and had just sufficient strength to grasp the loop of the net with its beak, when its feet began to draw up and its body to stiffen with the cold. Every effort was made to revive it, but it soon died from the effects of exposure and of salt water.—*Frank A. McNeill.*

A Whale of Bygone Days.

By Professor T. Thomson Flynn, D.Sc. *University of Tasmania.*

ONE of the saving graces of civilisation lies in this, that while man has much degenerated as regards many of his faculties—he has lost to a great extent the powers of sight, hearing, and smell—he still retains his gift of imagination. And one of the most stimulating methods of applying this gift lies in reconstructing the bodily forms and methods of life of animals which are long since extinct and which may have been the ancestors of those interesting living beings which form man's companions on the earth's surface to-day. It is obvious that no living being can exist for very long if its environment is unfavourable. It must be capable of responding to any exacting requirements which its condition of life may impose upon it. There are, perhaps, no living animals which have responded more to their environment and mode of life than have the whales —animals which have always been objects of interest and wonderment to the observer. The monstrous proportions to which some of them attain, their comparative rarity, the vivid impression of the story of Jonah, and the association of their capture with stories of human hardship, strength, and daring in the wind lashed seas of the "Roaring Forties" are all ideas which have been associated in producting this effect on the "Man in the Street."

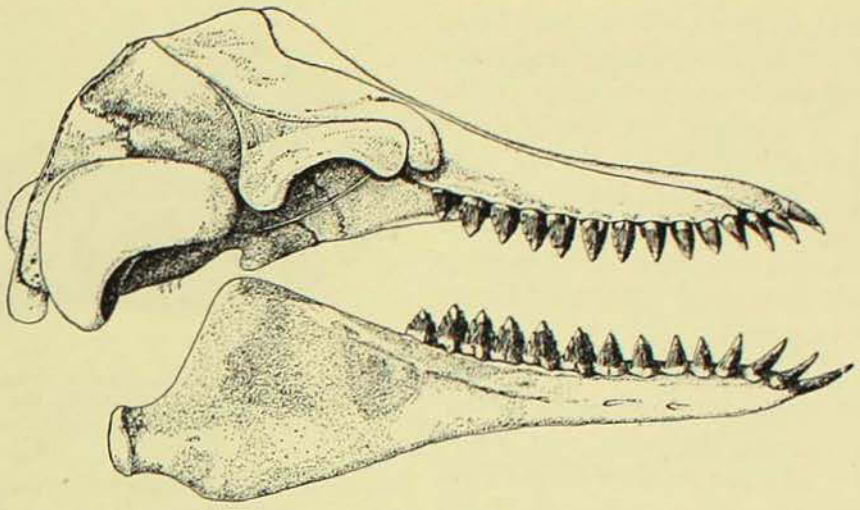
An examination of the body structure of whales has long ago shown us that they have descended from land animals. There are some who have suggested that their ancestors were reptiles, but it is almost universally agreed that these primeval ancestors belonged to the group known as mammals. Most of the larger animals on the earth's surface to-day belong to this mammalian group, which includes four footed, air breathing animals with a covering of hair and which suckle their young. The ordinary dog may be taken as a typical example.

Removing the remains of the fossil whale from the cliffs at Table Cape, near Wynyard, Tasmania.

There could hardly be two creatures more different at first sight than a whale and a dog. Yet the fundamental resemblances are there. The whale, just as the dog, breathes by means of lungs. It has to visit the surface of the water periodically to renew its air supply. The whale calf is born and nourished in exactly the same way as is the young of the dog.

Two of the most conspicuous differences between whales and the ordinary land mammal lie in the absence of hair on the former and the arrangement of their limbs.

It is usually believed that whales are

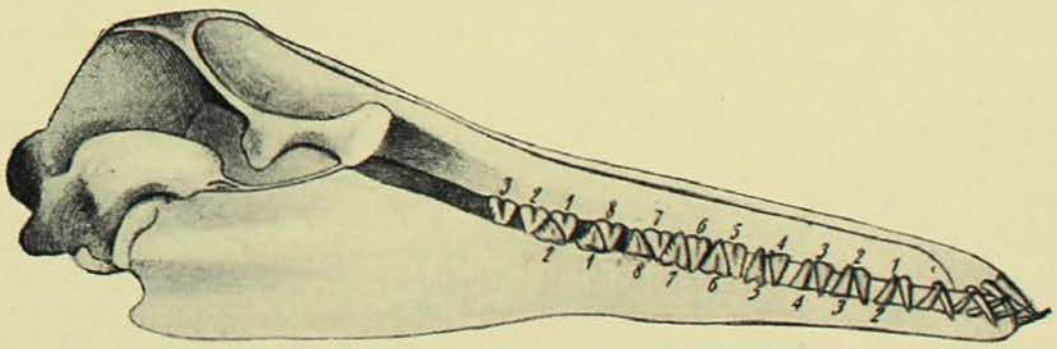


The skull of the Tasmanian whale (Prosqualodon davidis) fully restored. It will be seen that the snout is much shorter than that of the Northern shark-toothed dolphin, shown below. The teeth, however, are very similar.

quite devoid of hairy covering. This is only partially true. It is a fact that some whales when full grown have no hair of any sort, but in some of these it is found that the young one develops a small amount of hair which is afterwards shed. Some grown-up whales have hair but it is never well developed, and in fact the hairs are so few that they can be quite easily counted. They are always situated in the region of the upper lip, forming a sort of sparse "moustache." The structure and development of these hairs shows that they are quite of the same type as in other mammals, and that there is not the slightest doubt that they are the relics of the ancestral hairy covering now almost entirely lost.

The flippers or paddles of a whale correspond to the fore limbs of the ordinary mammal, although at first sight they are very different. They possess bones which agree exactly with those found, for example, in the fore limb of a dog, and these divide the flipper into parts representing the upper arm, the fore arm, and hand. The bones, however, are so flattened and brought so closely into contact that the only movable joint left is at the shoulder. This flipper forms a very efficient balancing organ.

Of the hind limb nothing is externally visible in whales. Some of its bones however, have been found in a degenerate condition in many whales, buried in the flesh in just the position



Shark-toothed dolphins inhabited the seas of the Northern Hemisphere in past geological ages. This represents the skull of one of them. The snout is very long compared with that of the Wynyard whale, but the number of teeth is about the same. These teeth, fang like in front and, at the back, cutting past one another like scissor blades, form an ideal means for the capture and preliminary mastication of such slippery and active prey as fishes.

[After O. Abel.

which would be occupied by these limbs if present. The hind limb must have disappeared at a very early stage in the evolution of whales, but one of the most remarkable and instructive happenings in connection with this question was the discovery in Canadian waters some two years ago, of a whale with a pair of well developed hind limbs each over four feet long.

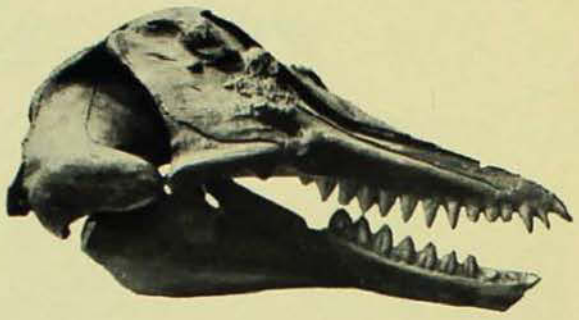
Whales are divided into two groups, those with teeth and those without. The latter group live on very small organisms in the water, these organisms being secured by a very efficient sifting out apparatus into the complex structure of which we will not enter here. Sufficient to say that it is composed of plates of horny material called "whalebone." But even in these "whalebone" whales it is found that the embryo develops a series of ordinary teeth which are later on shed and their place taken by the above-mentioned plates of whalebone.

It is however with the "toothed" whales—dolphins, porpoises, "killers," sperm whales and the like—that we are more concerned in this article and we will, I hope, be able to elucidate some of the chief features in the story of their evolution.

The story is of particular interest to us because recently there have been found, in the cliff beds at Table Cape, Tasmania, near the little town of Wynyard, the fossil bones of a very ancient whale, whose wonderful condition of preservation entitles it to rank as one of the finest fossils yet discovered. A cast of the skull and jaw of this whale has now been placed on exhibition in the fossil gallery of the Australian Museum. A photo. of this exhibit is shown on this page.

The specimen was observed in the face of a precipitous cliff, whose base is washed by the waves of the sea at high water. It was necessary to construct a platform for convenience in removing the remains. This was a matter of some difficulty, but the result paid for the trouble.

I have named this new whale after Sir T. W. Edgeworth David, the great Australian geologist and teacher, whose



Cast of the Tasmanian fossil whale as exhibited in the Fossil Gallery of the Australian Museum. [Photo—*G. C. Clutton.*

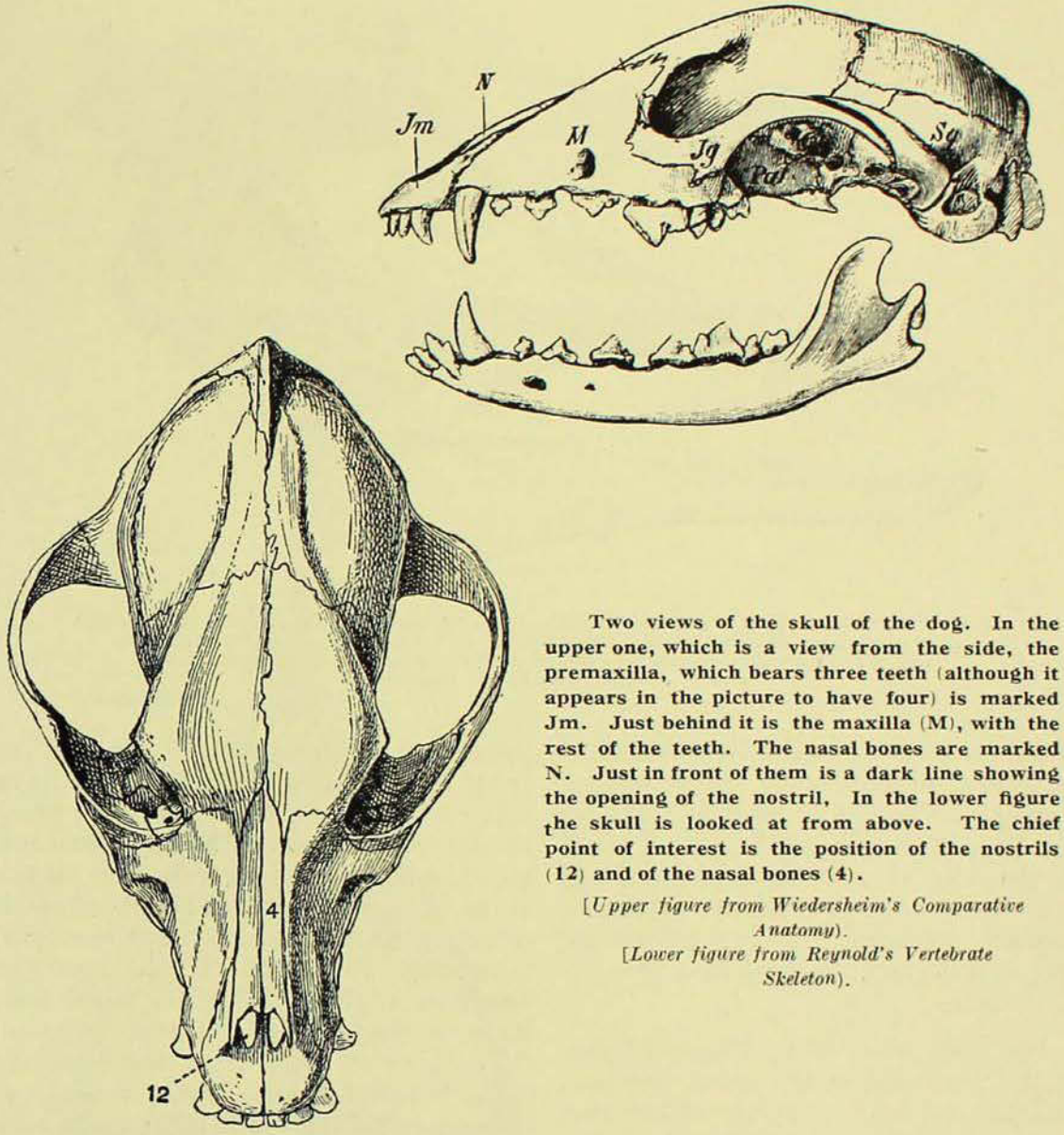
reputation has extended far beyond the country in which his work is carried on.

The mind of the ordinary mortal cannot conceive of the age of the beds in which the fossil was found. They cannot be less than some 20,000,000 years old—the age of Tutankhamen's tomb is a mere trifle by comparison.

A fearsome tooth, notable for its massive strength and a form which makes for great cutting and shearing power.

[Photo.—*G. C. Clutton.*

This ancient whale was extremely fierce, and was a fish feeder. It possessed extraordinary teeth one of which is pictured here. Notice, the shark like nature of this tooth. It is made for cutting and grasping. No whale of the present time has teeth like it. Yet we can never tell what scientific surprises the depths of the sea may hold in store for us. In his evidence before



Two views of the skull of the dog. In the upper one, which is a view from the side, the premaxilla, which bears three teeth (although it appears in the picture to have four) is marked Jm. Just behind it is the maxilla (M), with the rest of the teeth. The nasal bones are marked N. Just in front of them is a dark line showing the opening of the nostril. In the lower figure the skull is looked at from above. The chief point of interest is the position of the nostrils (12) and of the nasal bones (4).

[Upper figure from Wiedersheim's Comparative Anatomy).
[Lower figure from Reynold's Vertebrate Skeleton).

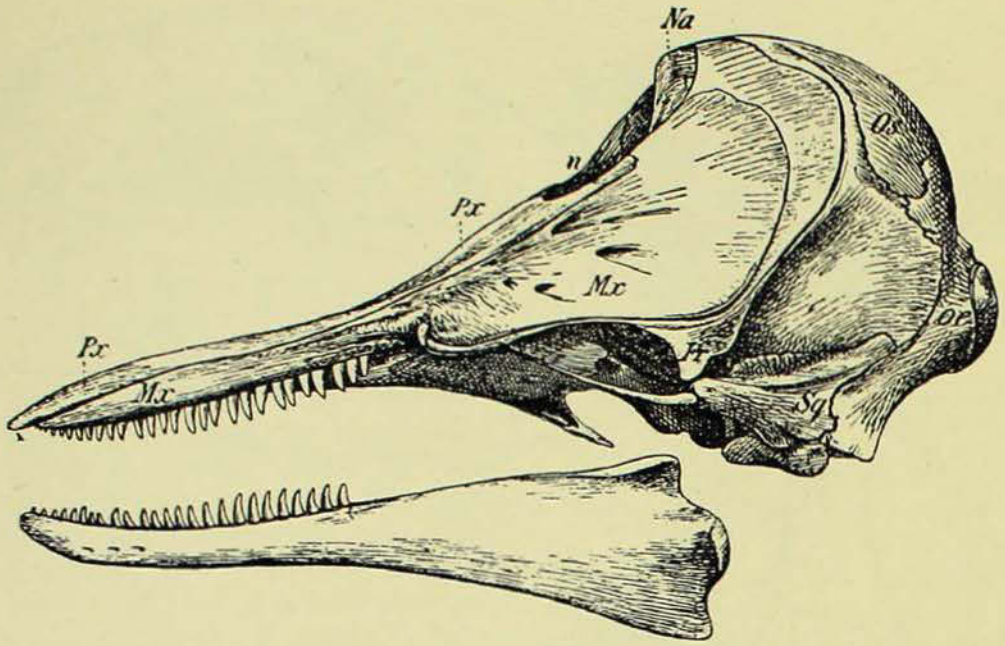
the Tasmanian Royal Commission of Fisheries in 1882 a witness stated that he had caught in the fishing beds at one time a warm blooded animal with teeth like a shark. This description would apply perfectly to these extinct or supposedly extinct whales and to no other animal.

There are many respects in which this whale shows a nearer approach to the ancestral mammals than do the toothed whales of the present day.

I show here the skull of a dog and that of a dolphin of the present time. Notice that the upper jaw of the dog on each side is formed of two bones, the premaxilla and the maxilla. Each of these contains teeth, the premaxilla bearing the three front teeth (incisors) while inserted into the maxilla are the remainder of the teeth which are divided into different sets according to their shape and function.

In the dolphin the jaw is also formed of the premaxilla (Px) and the maxilla (Mx). The maxilla bears all the teeth, the premaxilla having none and the teeth are more numerous than in the dog and of similar shape throughout. They are made simply for holding, not for cutting.

Let us see what are the conditions in this region of the skull in the Tasmanian fossil. The premaxilla and maxilla are present but the former has three teeth as in the dog, while the maxilla



Skull of a modern whale, a dolphin. All the teeth are borne on the maxilla (Mx.) while the Premaxilla (Px.) has none. The nostrils, or "blowholes," are towards the top of the head at the position marked n, while the nasal bones indicated as Na are quite behind the blowholes.

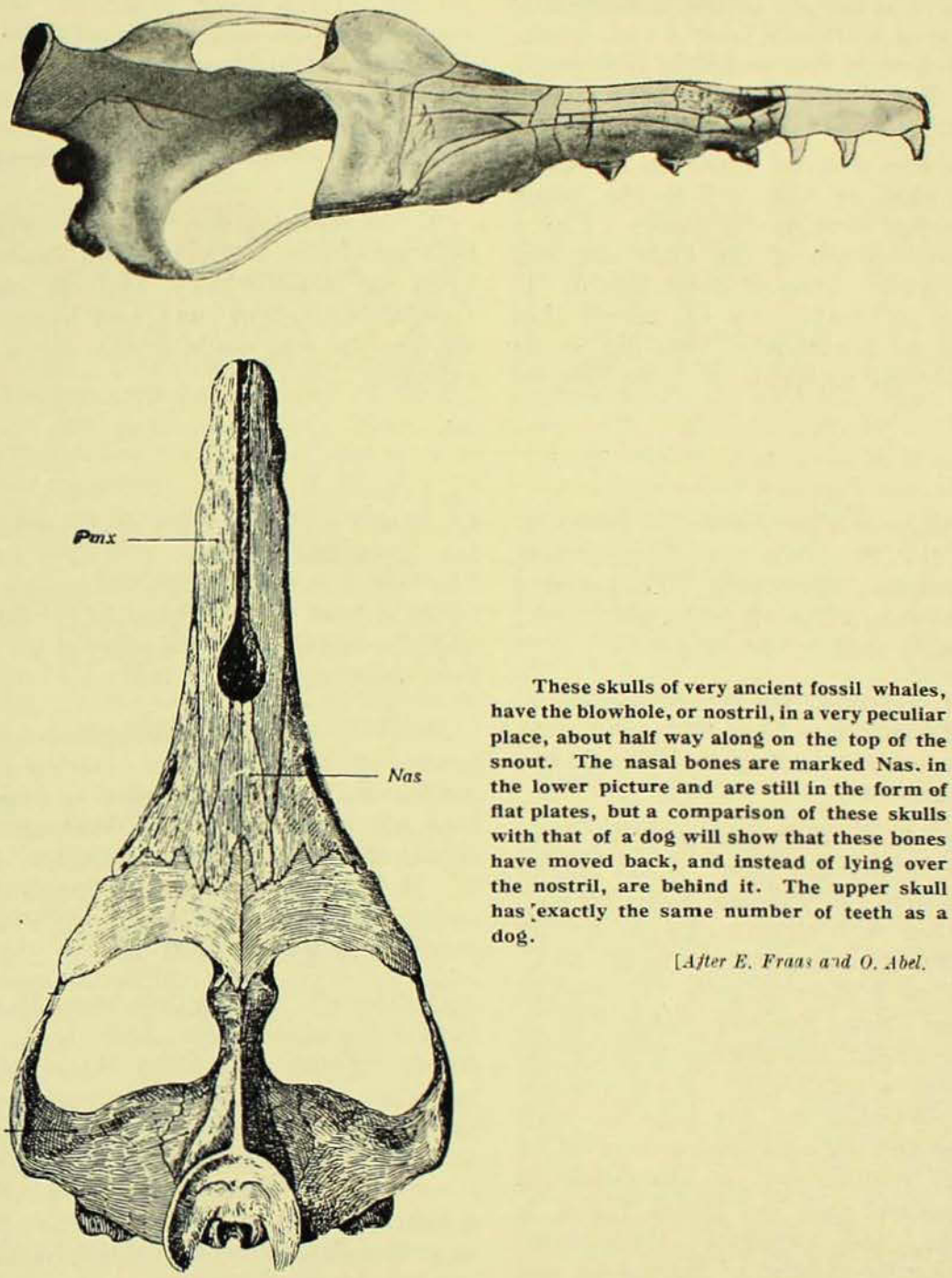
[*After Boas.*

bears other teeth which are divisible into sets according to their shape. Further while the number of teeth is less than in the dolphin it is more than in the dog. In all these points then, the Wynyard fossil whale is intermediate between the typical mammalian skull and the skull of a present day whale.

The dog's nostrils are situated right at the front end of the snout and are roofed over by two bones called the nasal bones, these being in the form of a pair of flat plates. What correspond to the nasal openings of the dog are, in the dolphin, situated towards the top of the skull and form the two "blowholes." They have been moved back and in the process have pushed behind them the nasal bones which have each become a mere nodule at the back of the blowhole. Various fossil whale skulls have been discovered showing the gradual movement backward of the nose and two of them I show here.

Accompanying this backward movement, the whale gradually loses its sense of smell. This sense is almost entirely absent in the whales of the present day and the blowholes are just passages to the lungs for breathing purposes. Consequently the nerves from the brain to the nose which have to do with the sense of smell have practically disappeared. The Wynyard fossil whale shows this process just on the verge of completion. The blowhole is nearly in its final position but the nasal bones are plates which still roof the blowhole slightly. Further than this, large passages for the transmission of the nerves of smell from the brain to each blowhole, have been found, so that the olfactory sense must have been fairly well developed in this ancient inhabitant of prehistoric seas. In such respects again, the Wynyard fossil shows a gradation between the living whales and their ancestors.

It is by means of discoveries such as this that we are able to piece together the whale story. This story is very incomplete. Numbers of whale-like animals have lived on the earth's surface and have died without leaving any descendants. One of the most widely distributed was the enormous *Zeuglodon*, a long, narrow, snake-like creature, measuring about sixty feet in length, which probably crept and swam among the shallow waters of the bays, and estuaries, of Europe and America. It has not been found fossil in Australia but the teeth of a nearly



These skulls of very ancient fossil whales, have the blowhole, or nostril, in a very peculiar place, about half way along on the top of the snout. The nasal bones are marked Nas. in the lower picture and are still in the form of flat plates, but a comparison of these skulls with that of a dog will show that these bones have moved back, and instead of lying over the nostril, are behind it. The upper skull has exactly the same number of teeth as a dog.

[After E. Fraas and O. Abel.

related monster named *Kekenodon* have been unearthed in New Zealand.

The Tasmanian fossil belongs to a primitive group called the Squalodonts (or shark toothed whales). A group of these with very long snouts was very abundant at one time in the seas of Europe and America and have left many skulls and teeth in the marine fossil beds of these countries. None of these long-snouted forms have been found in the Southern Hemisphere. The fossil whose cast is shown in the Australian Museum is much shortened in the muzzle. Two skulls of a closely related animal have been found in Patagonia so that these small but fierce carnivorous whales probably roamed the Southern Seas of that period.

The greatest light on the origin of whales, however, has been shown by discoveries in a district called the

Fayûm in Egypt. These indicate that the land mammals from which whales were derived were probably very primitive flesh-eating or insect-eating mammals.

It may not be amiss to speculate somewhat on what will be the future history of some of our whales. I have already spoken of the huge size and bulk which many of them attain. It is an inexorable law of nature that when an animal gets "too big for its boots" so to speak, it must become extinct. Time after time we come across examples amongst fossil animals of huge size which sooner or later have disappeared, while their smaller and more active congeners have lived, flourished and left numerous descendants.

In the ordinary way we can expect that extinction will very soon descend upon our larger whales, and the commercial instinct of man has hastened the process and made it the more inevitable.

"Records of the Australian Museum" vol. XIV., No. 1, was recently published. It contains, principally, the accounts of the research work performed by the scientific staff of the Museum :—

Mr. C. Hedley has prepared notes on some Australian *Cassis*, and clears away confusion surrounding *C. fimbriata* and *C. bicarinata*.

Mr. A. R. McCulloch supplies keys to the Australian fishes of the genera *Chaetodon*, *Callionymus* and *Cubiceps*, together with illustrations of several species, and collaborates with Mr. W. J. Phillipps in describing the variation of several New Zealand fishes. In a paper by Mr. McCulloch and Mr. F. A. McNeill a small crab, *Scopimera inflata*, described in 1874 from the East Indies and not again recognised till its recent re-discovery on the coasts of Queensland and New South Wales, is figured, and excellent illustrations, showing its method of burrowing and forming sand pellets, are given, and a new shrimp, *Atya striolata*, from the Nepean River, the first record of this genus from Australia is described.

Mr. W. W. Thorpe describes an aboriginal magical plate which is said to have been used both for curative and malevolent purposes. This plate originated in the north-west of Australia and travelled down to Ooldea, on the Trans-Australian Railway.

Mr. E. Le G. Troughton contributes a paper in which the genus *Leporillus* is revised and the stick-nest building rat *Leporillus conditor*, of which little has been known since its discovery by Sturt in 1844, is fully described. Illustrations and references to literature not previously cited, are given.

Mr. J. R. Kinghorn describes a new genus of elapine snake (*Oxyuranus maclennani*). This interesting specimen was presented to the Museum by Mr. H. L. White, whose collector, Mr. W. McLennan, obtained it whilst on an expedition in the Cape York Peninsula, North Queensland.

Professor T. Harvey Johnston, B. Sc., University of Adelaide, and Mr. G. H. Hardy, Walter and Eliza Hall Fellow in Economic Biology, University of Queensland, contribute a paper on some sarcophagid flies from Lord Howe Island, collected there by Mr. A. Musgrave of this Museum. One new species is described, and the others are identified with Australian forms. The question of their distribution is discussed.

Professor T. Thomson Flynn, D. Sc., University of Tasmania, shows that an Australian lizard (*Tiliqua scincoides*) is viviparous and possesses a well developed allanto-placenta of the conjoint type —a structure now recorded for the first time from a reptile, and which may, perhaps, have an important bearing in elucidating the difficult problem of the origin of the mammals.

In a Brisbane Garden.

By G. H. Hardy.

ONCE upon a time our garden was properly and elegantly cared for and there are many ruins about to indicate the pride taken in it by some former owner. Now, horticulturally, it is all but a desolate waste, and it has therefore reached the height of its entomological glory. One long wooden fence is falling with decay, and is barely sturdy enough to support its burden, a tangled creeper beloved by the butterflies. Under shelter of this and overhanging trees, a border of thick ferns is almost buried by newly fallen and long-decayed leaves. On the lawn, that looks as if it had never felt a mower, two well grown mango trees with dense foliage will be found to shelter quite a colony of miscellaneous insects if you care to hunt for them. The verandah, abandoned to the ravages of a wisteria, is also an insect sanctuary.

At the foot of the garden is the Milton Reach of the Brisbane River with its almost straight run of three miles to the city's only bridge. A steep slope of over thirty feet descends here, and the whole area on this hill side is waste land given over to one banana stool, one peach tree, two or three gum saplings, numerous weeds, grasses, and a creeping convolvulus.

From the road the house stands almost hidden by abundant foliage, and is surrounded by many trees in its own and neighbouring gardens. This gives such an air of solitude to the house that a more isolated spot could not be found within the whole of Brisbane's suburbs.

The animated stock includes many handsome insects, spiders of all sorts and sizes, lizards, frogs, harmless snakes, bats, opossums, native bears, numerous birds, including the kookaburra, another kingfisher, the frogmouth, owls, doves, and smaller kinds. About a mile away is the Mt. Coot-tha reserve, and most creatures found there will be found somewhere and at some time in our garden. The eagle visits the retreat at times and the curlew cries across the reach. Owing to the wild aspect of the river front, stray tortoises, seeking a safe and neglected spot wherein to lay their eggs, are induced to visit our grounds.

Frogs, wasps that build mud-nests, spiders, and (unfortunately) mosquitoes are constant inhabitants of our house. Moths, white-ants and other insects dance nightly attendance on our illuminations, which flying visits are fully appreciated by the entomologist. Here if anywhere is a vast amount of life to be observed and recorded.

THE LANTERN FLY.

One night, whilst we were sitting at dinner, a will o' the wisp visited the darkness of the adjoining room, and, with his lantern, showed a light only to be extinguished the next moment. This being repeated several times induced me to desert my wife and my meal, only to be bogged later in speculating on this problem of nature. Doubtless you have guessed that my will o' the wisp is the lantern-fly (*Luciola*), a beetle whose self-illumination one would expect to be more destructive than beneficial. Scientists generally admit that the light which exists near the apex of the abdomen on the underside, is not phosphorescence, and they describe it as luminescence. Some consider that it is caused by a slow combustion within the luminous organ, because, in respiration, the increasing and diminishing of the air supply would account for the intermittent light.

The luminescence is amply sufficient to tell the time by if the insect is rested upon a watch in the dark. Placed in an entomological glass-bottomed box, it gave off sufficient light to illuminate the whole of the interior, which, being

white, reflected enough light to reveal the colour of the red thorax against the black elytron.

One specimen at the end of the lantern-fly season contrived to get herself where she was not wanted, and, later, when retiring for the night, I found her still "luminescing" but enveloped within a robe of silk and resting upon the dressing table whereon the spider had ejected her. The next morning she was still in this condition but dead, and the whole area where the luminescence took place was quite bare of the web ; it was quite easy to slip the beetle out of her silk night-dress through this aperture.

Whether this absence of web on the underside of the last two segments of the abdomen was due to the spider's refusing to face the luminescent area, or whether the slow combustion that is supposed to take place was sufficiently strong to burn away the web, I am sorry to say I cannot tell, for this was the last of the season, and nearly a year must pass before more can be procured to experiment with.

THE WAY OF THE FRUIT-FLY.

The peach tree which stands on the slope to the river is completely hidden from the house ; it is only a small tree, but it was prodigiously laden with fruit that needed but a week to ripen. A basketful was picked for stewing purposes, and one or two when opened were found to be infested with fruit-fly maggots. Two days later a second basketful was picked and only one in ten found free from the maggot. Three days later not one peach of the whole remainder of the crop could be found, they had all disappeared. Such a wholesale disappearance was not due to the activities of the fly, nor yet to flying-foxes ; it was a thief with the best of intentions that had gathered the lot, and who ever it was that had our fruit he was himself "had."

The sudden raid on, and complete ruin of a crop by the fruit-fly, is typical of a fruit-fly attack, for within a few days the whole are infected, even although no fly may be noticed as in this case. The flies have been observed to attack almost every kind of fruit, many of which do not succumb to the evil. After the episode of the peaches, the flies invaded the mangoes, and the fruits attacked were marked for further observation, but in no case did the maggots develop therein, showing that mangoes have properties that make them resistant to the fly. Thick-skinned lemons, known locally as bush-lemons, are also resistant stock, as the flies cannot pierce the skin with their ovipositor, though they are often seen attempting it. Some thin-skinned fruits such as Japanese plums may have a different but quite as mechanical a method of resistance. This plum is a remarkably juicy variety, which property is its safeguard against the fruit fly, for, when the skin is punctured the juice squirts out and the egg and ovipositor are ejected on a succulent globule.

THE SLEEP OF THE NATIVE BEE.

Have you ever seen a native bee asleep ? The female is supposed to retire within the hole or burrow and sleep upon her job. Not so with the male, however, for this wanderer spends the night out, sleeping along the highways and byways of the bush. The males of some bees collect together for company, and they can be seen clustering on a twig, blade of grass, or other support they may choose, their numbers per cluster sometimes reaching up to hundreds.

Near the front entrance to the garden there is a wooden archway abandoned to the growth of wild nature and the remains of a fernery it once harboured. It is from here that the tumbling down fence with its old-man-of-the-sea creeper has its beginning, and it is at this place nightly, as long as their short span of life lasts, that the males of a species of *Anthrophora* collect for their nightly bivouac.

But there is one curious habit about this bee that I have never before noted in a sleeping insect. Doubtless you would expect, as I did, that the bee would cling by its claws to its twig and

settle down for the night. I watched them collect, first one, then a second, each feeling round for a place to rest on a long, bare, drooping tendril of the creeper. When two or three had settled, others began to gather faster, and, several arriving from various directions almost simultaneously, the vacant spaces were soon filled. One feeling himself jostled threw out all his six legs at once and began to wave them, in unison, to and fro, and yet he retained his position in a most miraculous manner. Soon another was doing the same, and yet another, without apparent support, was beating the air.

With a twig I touched all those at rest and had every one doing the trick. It was then I found that this bee did not cling by his claws at all; his legs fell together beside the thorax in the same position as they occupied just before he emerged from his cocoon, and all the support he had was secured by the mandibles. No matter how one held him when asleep, head up, head down, or in a horizontal position, his body still lay parallel to, but not touching, the object to which he attached himself, as, gripping by his jaws, he fell to slumber.

"*A Bush Cinema*," By "Te Whare," Sydney, 1923.

This interesting booklet contains many interesting natural history notes and illustrations, mostly from original photographs. Much of the matter has already appeared in the "Aboriginalities" column of the "Bulletin," in the "Sydney Mail" and in "Smith's Weekly." Nature lovers will be glad to have these scattered notes collected in a handy form. Our copy from H. V. Edwards, Bega.

There was recently issued a report by Miss Mary J. Rathbun, of the U. S. National Museum, Washington, D.C., U.S.A., upon a portion of the Decapod Crustacea dredged by the late F. I. S. "Endeavour." The report forms vol. V. part 3 of "The Biological Results of the Fishing Experiments carried on by the F. I. S. 'Endeavour,' 1909-14." These reports are issued by the Commonwealth Department of Trade and Customs, but their production is supervised by the Australian Museum. As an illustration of one of the Museum's activities it may be noted that the suggestion to collect the valuable material being dredged whilst exploring for fishing grounds, and to submit it to leading authorities for elucidation emanated from here. These authorities, without remuneration, willingly gave their labors in the cause of science, the advance of knowledge being their sole reward. Some thousands of specimens were collected upon these trawling cruises, many for the first time. These were all sorted and primarily classified here before being despatched to the various specialists. Rarely has a continent had such an opportunity to have its pelagic, or deep sea, fauna so thoroughly investigated at such low cost.

The Sulphur Island.

By L. H. Morrisby.

DISTANT about 200 miles due east from the southern end of New Caledonia, and not far off the passenger route from Sydney to Suva lies Hunter Island. Although it is marked on the map accompanying the latest hand-book of the Pacific Islands, that work contains no description of the island. There seems no doubt that the island has never been visited by scientists, since no information is available, at all events in Sydney, as to its formation, fauna, or flora. And, indeed, it is most probable that no white man had ever landed there before November of last year, when my brother and I made it our business to land, while on our way from Norfolk Island to Fiji in the ketch "Tasman." But as to the certainty of that, I am open to correction.

It was at night when the "Tasman" reached Hunter Island, but, as we were unable to anchor, we hove to till the following morning, and then ratched up under power to a poor shelter under its lee, where we anchored in twenty fathoms. Taking with us in the dinghy our camera, tools, and specimen bag, we tried to land in a small bay on the N. by E. end, in which there is a large rock with a passage between it and the island, forming a bay, with a foreshore of boulders. The sea here has a trick of breaking suddenly and treacherously, and a huge breaker, dashing up without any warning, combined with a fierce undertow to upset the dinghy with all its contents, to stave in two of its planks and throw us against the rocks. We were badly bruised, while oars, camera, tools, and a twenty fathom rope all disappeared. The rope and camera I managed to rescue, but nothing else.

At the base of a cliff, immediately in front of where the boat capsized, is a sulphur spring from which strong fumes arise, as from a bucket of burning sulphur. All the rocks nearby are hot. Inside a forty-foot radius were lying a number of dead birds, and, on the rocks, some crabs of a yellowish-green colour. The surf as it fell here on the month of the blow and on the hot rocks, was turned instantly into hissing and growling steam. The birds and crabs had undoubtedly been overcome by the noxious fumes. Further along, at the base there are hot vapour-jets, some of which have a white, lime-like, stalactite formation in their bore; others are of a cream colour, others a sulphur. These stalactites crumble into powder when one tries to remove them; their fumes cut the breath and make the eyes tingle.

The cliffs themselves are of a rocky composition unknown to me, but basalt is in plenty. Some of the rock when broken disclosed various tints.

From the boulder shore a slight incline, up which we climbed, leads to the top of the island. There were signs hereabouts of a huge landslide. In places where tons of rock and earth had fallen and rolled to the sea, the ground was barren of herbage. In other places the cliffs had split asunder, and big boulders were lying about, some needing but a touch to dislodge them. The climb to the first level was about 700 feet, over a floor of plentiful, coarse, short grass, pig's face and white convolvulus. We noticed some creepers, one of which has a fruit or pod like the passion-fruit; also a grass like the pampas-grass, knee-deep, and carrying a beastly burr, which clings to your clothes, woollen or cotton, and makes walking a horror. No vicious Australian burr can be compared to it. It works up your trousers and down your socks and draws blood. The first flat was covered with this curse, and with a few acres of bush resembling a Moreton Bay Fig, but only eight to ten feet high, with a spreading top upon which hundreds of sea-birds had their nests; the ground here was knee-deep with droppings.

The birds were mostly blue-billies and gannets and bos'n birds, such as inhabit Lord Howe Island and the Admiralties. Of the *Notornis alba*, a white bird with a red bill, which seems to have become extinct since Lieut. Ball discovered it on Lord Howe Island in 1788, I saw no trace. One large black bird, with pink wattles and a hooked beak, which lays a huge egg of a beautiful and delicate shell, full in the centre and tapering rather quickly at each end, is very plentiful here. I have been told it is the frigate bird. And then there is, in its home in the deep clefts of the cliffs, a little, shy, speckled grey and brown bird, about the size of a carrier pigeon. It moans continually in a weird, distressing way, not unlike a man in mortal agony. Its name I do not know. The little whale-bird, so common at Norfolk Island, is here also. The only insect we saw was a green grasshopper; no lizards, snakes, or rats were observed.

From the summit of the highest point we had a good view of the greater part of the island, disclosing patches of the above-mentioned fig, a few stunted pandanus trees, a few hibiscus. There was no sign of any timber or other shrubs. The soil is extremely porous and rich. We found no fresh water; it is doubtful if there is any, because of the porous nature of the place. But, as time was short, the wind and sea growing angrier every hour, and progress so difficult on account of he burrs and concealed bird and sulphur holes, we had reluctantly to be content with only a few hours inspection. The problem of finding our way back to the ketch, on which was the third member of the crew, our collie mascot, had yet to be faced, robbed, as we had been, of our oars, and faced with such a break in the bay where we had been capsized that any attempt to launch the dinghy from there would have been madness. There remained only a piece of board for a scull. With the aid of the rope-painter we dragged the boat up a nasty cliff of 200 feet, and with difficulty succeeded in launching her from a jutting reef of rock; and then, using the board, we reached the ketch at 8.30 that night. Next morning we saw that further landing was hopeless, so we heaved up the anchor and shaped a course for Fiji.

Landings might be made, here and there, but they would afford no access to the interior, being bounded by unscalable cliffs. I secured specimens of sulphur rocks, alum, and basalt, but most of them disappeared as we launchd the dinghy. The photographic negatives we made were also broken, These losses were very disappointing. but I hope to make up for them when I next visit Hunter Island. When I have more time I intend making a thorough investigation of this strange and unknown place, with its jets and its fumes, visible from the sea on three sides, that call to mind awesome Doré drawings of hissing pools reserved for doers of ill-deeds.

In the coming August the Pan-Pacific Congress will meet in Melbourne and Sydney to discuss problems which are of special interest to the nations bordering on the Pacific. There will be representatives, eminent scientific men, from all these countries, and the meeting cannot fail to give an impetus to the study of some of our fundamental questions, zoological, geological, sociological and economic. The meetings of the congress will be held in the Universities of Melbourne and Sydney, and it is expected that all those who are interested in the advancement and welfare of Australia will become enrolled as members. Various attractive functions, including receptions, popular science lectures, excursions to localities of interest, will be held in connection with the congress.

The Use of Australian Fig Trees and Their Associated Fig Wasps in Reafforestation Work in the Hawaiian Islands.

By C. E. Pemberton (*Assistant Entomologist, Hawaiian Sugar Planters' Association.*)

RESIDENTS of Australia, familiar with the Moreton Bay Fig tree, *Ficus macrophylla*, and the Port Jackson Fig, *Ficus rubiginosa*, will be interested in the progress of a reafforestation project now in operation in the Hawaiian Islands, wherein these two splendid trees are being particularly utilized.

In December, 1920, the writer was detailed to Australia to study and introduce these and other Australian trees of the genus *Ficus* to Hawaii. A few fine specimens of both *Ficus macrophylla* and *Ficus rubiginosa* were already growing in Honolulu but had never produced fertile seed and could not hence be used as mother trees for extensive planting. The prime object of the visit was to obtain quantities of fresh seed of these trees, and particularly to ascertain precisely why such trees produce viable seed in Australia but not in Hawaii and elsewhere where a few have been planted.

Both the Moreton Bay and Port Jackson Figs produce fertile seed in and about Sydney. Through the courtesy of Mr. J. H. Maiden, Director of the Sydney Botanic Gardens, the privilege was obtained to pursue a study of the problem and collect seed of these trees in the Sydney Gardens and Domain. Briefly summarised, the results of this work were as follows.

The Moreton Bay and Port Jackson Figs were found to produce fertile seed only through the agency of certain minute insects which act as pollinators. Each type of fig tree has its particular fertilizing or pollinating species of insect. The insect peculiar to the Moreton Bay Fig occurs in its fruits,

Pleistodontes froggatti, the Moreton Bay Fig Wasp, magnified about twenty-three times.

[*Agric. Gazette, N.S.W.*

pollinates the minute flowers within the fig in the manner described below and lives tightly enclosed therein during all but a few important hours of its nine to twelve weeks of life. This insect was not found in the fruits of any other tree, plays no part in the development of seed of any tree other than the Moreton Bay Fig, and naturally has developed or evolved into its own peculiar form coincidentally with the development of this tree in the coastal regions of New South Wales and Queensland, where it is indigenous.

The placing of fine cloth gauze over branches bearing small figs just forming, prevented the fig-insects from reaching them, and in every case no fertile seed developed. Other figs, so screened, but given one or more of the fig-wasps, developed perfectly and contained fertile or germinable seed. Moreton Bay Fig trees planted by man in Melbourne, New Zealand and Fiji, where the tree is not native and where the particular fig-insect above mentioned does not occur, were examined. No fertile seed develops on the trees in these localities. The reason is evident; the necessary pollinating insect is not there. If it has ever

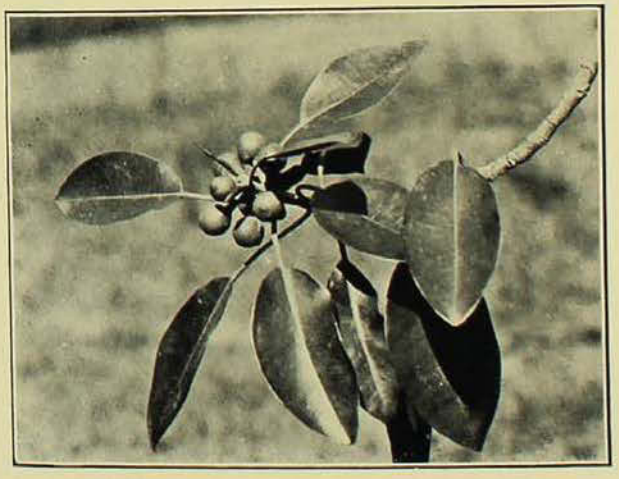
reached Melbourne it has not survived, probably because of the cold winter.

The process of seed fertilization in the case of the Port Jackson Fig was found to be exactly similar to that of the Moreton Bay Fig, excepting that a different species of fig-insect is concerned in the transfer of pollen.

A form of the Port Jackson Fig, growing near the National Art Gallery, Sydney. This species may be easily recognised from the Moreton Bay Fig by its smaller leaves.

[Photo.—*A. Musgrave.*

The life habits of the fertilizing insect associated with the Moreton Bay Fig and the complex structure of the fig itself, all adapted perfectly for the fulfilment of their mutual needs, are too elaborate to present in detail here. The principal facts, however, may be given. The insect emerges from a ripe fig by boring out. It has been a developing larva, or worm-like individual for many weeks within the fig, together with from fifty to one hundred other larvae of the same sort. It has lived and fed in a particular part of the fig. When the fig has finally become fully developed, certain of its flowers, all tightly enclosed inside the fruit, open and scatter a profusion of pollen-grains within the interior. It is then, through the marvellous provision of nature, that these worm-like creatures have completed their development, pupated and become transformed into active wasp-like fig-insects. These mature insects immediately bore out of the fig, as noted above, and come to light with many pollen grains, excessively small, adhering to the body. As soon as the insect is out it searches over the tree or another one in the vicinity, for a very young fig just forming on the tree, carrying the pollen unconsciously with it. It so happens that the young fig, for which the insect is searching, is filled with certain flowers just ready for the reception of pollen. When the fig-insect has found such a fig, it immediately bores into it and begins laying eggs to the amount of about seventy-five. In doing this it accomplishes the principal work in its own life—the housing for the feeding and development of its progeny. But in attaining this object, it has done the tree a service of vital importance. It has carried pollen into the young fig at exactly the time the female flowers within the fruit need the pollen for the fertilization and development of seed. The tree is thus absolutely dependent upon this particular insect for its reproduction or perpetuation and the insect equally in need of this tree, and no other, for the continuance of its existence. This is a marvellous provision of nature to ensure cross-pollination.



Fruit and leaves of Ficus macrophylla, the Moreton Bay Fig.

[Photo.—*A. Musgrave.*

The Port Jackson Fig was found to be inhabited and pollinated by another insect, related to, but different from that in the Moreton Bay Fig. The important relation-

ships of this insect to the development of seed on the tree and the beautifully adapted habits of the insect to the special structure of this fig were found identical with those determined for the Moreton Bay Fig.

The insects in neither case are new to science. Mr. W. W. Frogatt has collected *Pleistodontes froggatti* and *Pleistodontes imperialis* from the Moreton Bay and Port Jackson Figs respectively, and was the first to publish interesting data respecting them. This appeared in *The Agricultural Gazette of New South Wales* for June, 1900, and in his *Australian Insects*. The complete details of the writer's work have been published in the *Hawaiian. Planter's Record* for June, 1921.

With the above facts in hand one could be certain that an introduction of these living insects to the Hawaiian Islands was essential before the few trees already in the Islands would be made to produce good seed. This was done. Shipments of live insects from the Moreton Bay Fig were successfully made from Sydney in September, 1921, and January, 1922. Both became well established in the trees in Honolulu on which they were liberated and have continued living through many generations of their cycle, actively operating

A Moreton Bay Fig, Ficus macrophylla, growing in front of Kirribilli House, Sydney. This tree is over a century old.

[Photo.—*A. Musgrave.*

An avenue of Moreton Bay Fig trees growing in the Sydney Domain.

[Photo.—*A. Musgrave.*

in those trees and inducing the development of hundreds of pounds of fertile seed right up to the present writing (January, 1923). Hundreds of thousands of young seedling trees have been since secured through the planting of this seed, and it has been made possible only through the introduction of these particular insects. Up to the present at least a million of these young trees have been set out in the Hawaiian forests to serve the desired purpose of aiding in the future conservation of rainfall, increased humidity, cloudiness, fogs and rain. This propagation of seedlings and planting is going on today and will continue.

These trees are hardy, have vast soil-gripping, soil-holding root-systems, are not timber trees and hence not likely to fall under the ruthless axe, are semi-tropic and exceedingly prolific, which makes them in general ideally fitted for reafforestation in large, partially denuded forest-reserves, much in need of a new blanket of green, deeply-shaded growth. The day should come when Australia can be looked to as a country which has given us one of the most important elements of our necessary forests.

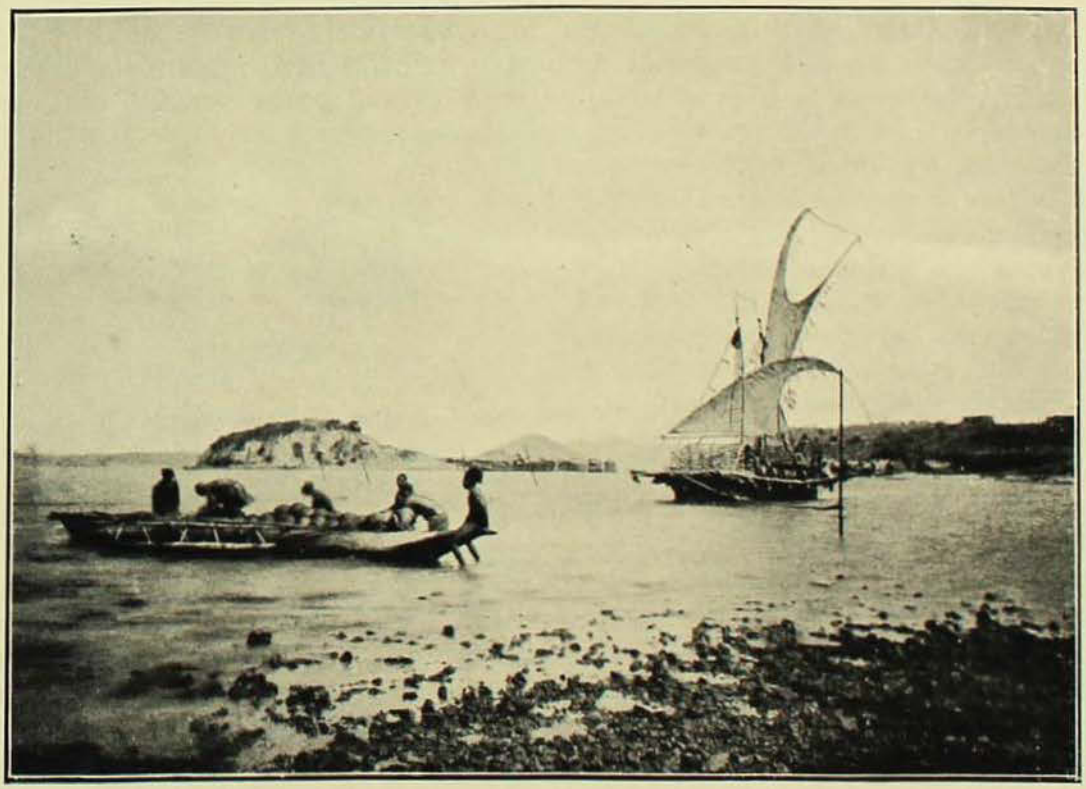
Barter, Currency and Coinage.

By William W. Thorpe.

TO-DAY, when one handles money, one is more concerned regarding its purchasing power, or value, than its appearance. As a work of art a coin may be disparaged, but all would realise how essential money is to our life, and what an important factor it is in the mechanism of commerce.

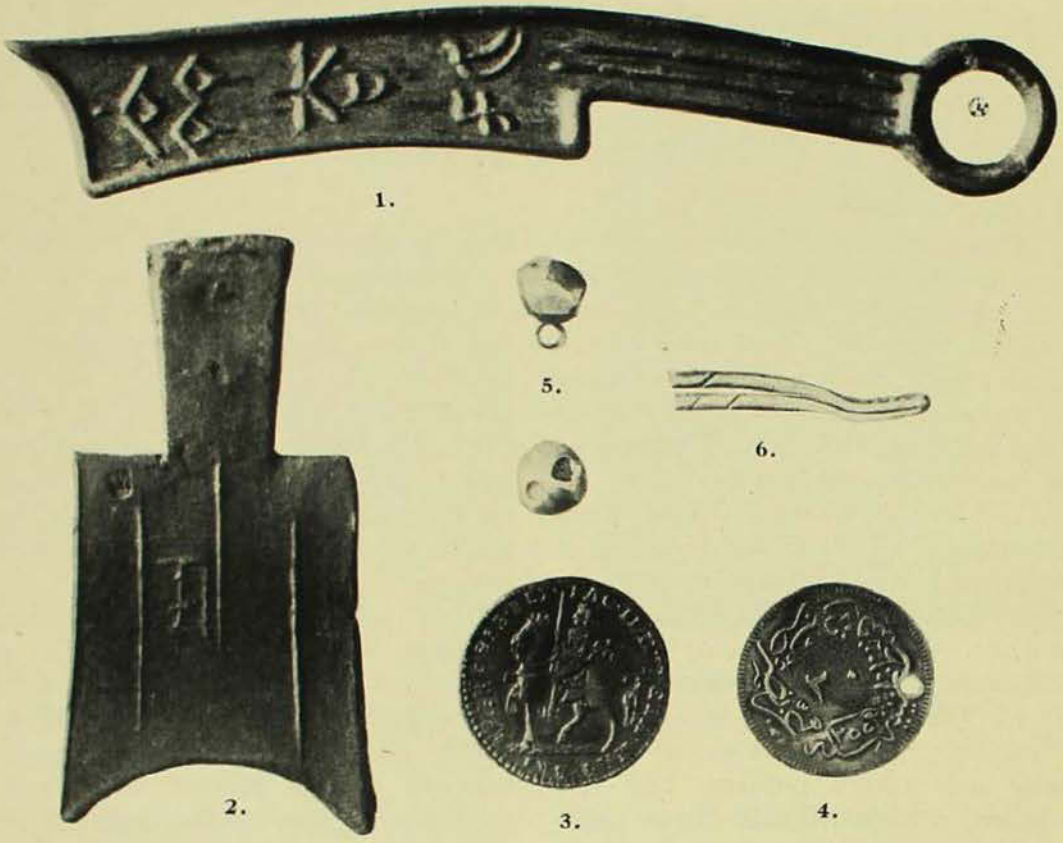
In days of old, those days so often spoken of, money as we understand it was unknown and barter ruled in its place, one commodity being exchanged for another. As an instance of this, one may cite a trading custom that obtains to-day in Papua, where stone-age man yet lingers. The natives of Port Moresby are adept potters, but the sago palm, which affords their principle article of food, does not thrive in their district. Away to the west in the Papuan Gulf the sago palm flourishes, and, as the natives there are not pottery makers, what is more natural than for them to trade? So every year, at the end of September or beginning of October, the season of the south-east trade wind being then at its close, a fleet of lakatois, or large sailing canoes, laden with pottery leave Port Moresby on a voyage to the deltas of the Papuan Gulf, whence they later return with cargoes of sago.

This primitive form of exchange, through which all communities must have passed, later gave way to currency or the adoption of articles not easily acquired or manufactured. A host of things have served in this capacity—grain, wheat, rock-salt, tobacco, gold-dust, cinnabar, sheep, cattle (from which the word *pecunia* is derived), skins, cloth, knives, armlets,



Loading Lakatoi at Port Moresby.

[*After Lindt.*



(1) Chinese "Knife Money." (2) Chinese "Spade Money." (3) Bronze Crown of James II., 1690. (4) Turkish Coin with kalima, 1839. (5) Siamese "Bullet Money," or "Pical." (6) Indian Currency, or "Larin."

Reduced by one-third. [Photo.—*G. C. Clutton.*

rings, and many other commodities. Even to-day some are employed as currency. In the early days of settlement here, rum was used in this manner. It was quite usual for a contractor to be paid in this spirit, and we read that the best inducement to recapture an escaped convict was to offer a reward of five gallons of grog. This form of currency was at first tacitly recognised, but later it became an almost ineradicable curse, and before its final disappearance as a medium of exchange, it caused much recrimination between those favouring its retention and the local authorities.

Some of the forms of currency were perpetuated in the shape give to the coinage. Chinese annals record the issue of bronze "knife money" as early as the 7th century B.C., and shell shaped coins, or metallic cowries in the 6th century, B.C. Later, in China also, "spade money" was circulated. It seems that currency and coinage were for some time recognized side by side, as in B.C. 221, the emperor forbade the use of gems, pearls, cowries, and other natural forms.

Lydian Coin.

[*After MacDonald.*

As distinct from currency, a coin may be defined as an object, usually of metal, bearing an authoritative imprint. The credit of striking the first coin has been divided between Europe and Asia. Sometime about 700 B.C. silver coins were struck at Aegina, Greece, by Pheidon, King of Argos; but almost contemporaneously electrum coins were made at Lydia, Asia Minor, at the instance of King Gyges. These electrum coins contained the proportions of twenty-three per cent silver and seventy-three per cent gold. These early

coins are just oval or bean-shaped lumps of metal, bearing on one side the seal of authority responsible for their purity and weight, and on the other side the scars produced by pressure against the square-headed anvil when the seal mark was hammered on. This simple process was improved upon later, by the addition of a second engraved die, beneath the piece of metal intended for a coin, so that the single blow of the hammer would provide it with a reverse. While most countries to-day have a circular coinage this form is not universal. Other shapes seem to predominate in the east. The Chinese have, since B.C. 275 issued circular coins with square holes which have only recently been superseded. This perforation was for the convenience of threading the coins, a feature which has its good points. In Bijalpur, Bombay there is a form of silver wire currency known as "larin," while in far Siam inscribed silver bullets are passed from hand to hand in business transactions.

According to the exigencies of state, makeshifts and substitutes have been improvised. Amongst these may be mentioned siege or obsidional money, of which there exists to-day a fine series to teach us history. James II., when compelled to flee to Ireland, produced a series of coins known as "Gun money," composed of bronze, and marked with a fictitious value. In justice to this monarch, it must be stated that he intended to redeem them at their face value, when he was once again secure upon the British throne. Other kings have been in similar straitened circumstances, notably Charles I. when he was contesting with Oliver Cromwell for the governance of England. Pieces of plate of varied shapes and sizes bearing curious portraits of the castles wherein he was besieged have been handed down to us and form part of the collection in many museums. The greater number of European coins have on the obverse, if the country is a monarchy, the portrait of a king or queen or a crowned regal monogram. Should the country be a republic the obverse has a design emblematic of freedom. In Mohammedan countries, as it is contrary to religious principles to depict a sultan or kaliph, his place is taken by the *kalima*, or creed, which reads "there is no god but God, and Mohammed is the prophet of God."

Notes and News.

Under the auspices of the British Museum Captain G. H. Wilkins is leading a collecting expedition into the wilds of Queensland and has commenced operations on the Moonie River in the South West of that State. The expedition will last for two years and will operate chiefly in Queensland and the Northern Territory. The British Museum and Captain Wilkins are to be congratulated for their enterprise and we wish all success to the expedition, but we cannot help reflecting rather sadly that our own Museums are so handicapped by lack of funds that they find it impossible to do more than a little sporadic collecting, and no Australian museum has even one collector whose whole time could be given to field work.

Among the recent vistiors to the Museum were Dr. Casey Wood, the well known ornithologist of Chicago, U.S.A., who has for many years been making a special study of the eyes of birds ; Dr. T. T. Flynn, Professor of Biology in the University of Tasmania ; Professor Watson and Professor Mainwaring of Adelaide.

From the daily press of 14th May we learn that " A cormorant drive was held on Umeralla and Murrumbidgee Rivers. Shooters were allotted stations along the river banks by the Cooma Progress Tourist Association which organised the shoot." It cannot be too strongly emphasised that we have to be very cautious in interfering with the balance of nature. Years ago an organised and fairly successful attempt was made to shoot down the cormorants on the Lower Murray. But, we are told, this slaughter did not result in an improvement in fish life as had been anticipated. On the contrary it had a harmful effect, for, with the reduction in the number of cormorants, eels, " yabbies," and other forms which prey on the fry of useful species, flourished unchecked, and there was a decided diminution in the number of edible fishes.

By the passing of E. J. Banfield of Dunk Island, North Queensland, Australia has lost a naturalist and writer whose fame has spread far beyond the confines of our island continent. Twenty-five years ago the " Beachcomber " selected Dunk Island as his residence for health reasons, and so congenial did he find his tropical isle, that it became his permanent home till his death on June 2nd. He was an accomplished naturalist, a keen observer, and a writer of delightful books. His first work " Confessions of a Beachcomber " weaved a romantic spell round his little island, which subsequently became a sort of Mecca for scientists and tourists. His succeeding books, " My Tropic Isle " and " Tropic Days," did but enhance this spell, and many readers of these charming works have felt the impulse strong within them to leave the " roaring street " and go " a-Dunking."

The late Mr. Banfield had long been a valued correspondent of this Museum, which was indebted to him for many interesting specimens and natural history notes.

Mr. C. Hedley, who is the Australian Museum representative on the Barrier Reef Committee, left Sydney on 19th May to join a party led by Professor H. C. Richards of Melbourne for the purpose of exploring the reef. A Queensland Government steamer has been placed at their disposal and the expedition intends to proceed along the reef, making lands at several places. Important scientific data are expected to result from their surveys and observations.

The Ornithological Section of the Royal Zoological Society of New South Wales held its April meeting in the Lecture Hall of the Museum. There was a good attendance of members and their friends as well as of the public, and the proceedings took the form of a number of short lectures illustrated by numerous lantern slides.