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Willy Wagtail

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THE AUSTRALIAN MUSEUM

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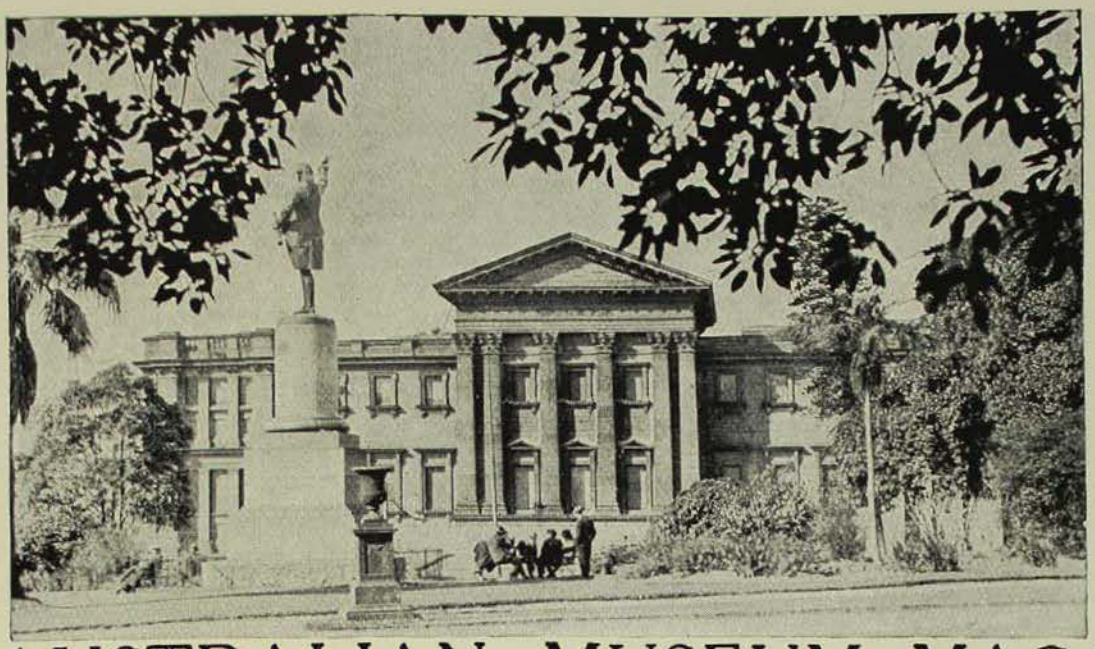

THE AUSTRALIAN MUSEUM MAGAZINE

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■ OUR FRONT COVER. The Black and White Fantail Fly-catcher, more commonly known as the Willy Wagtail (*Rhipidura leucophrys* Latham), is by Lilian Medland. It is one of a series of postcards issued by the Australian Museum.

This saucy little bird has endeared itself to most Australians by its fearless confidence and familiarity. It is widely distributed throughout Australia, and is insectivorous in habit. It may often be seen perched upon the backs of domestic animals, and it delights to flit about their muzzles whilst they graze, snapping up the insects they disturb. The nest is a very neat cup-shaped structure, covered without with greyish-white cob-webs, and lined with horsehair and fine roots. Three eggs are laid, cream with an indistinct brown band round their larger ends.

Its usual call-notes resemble the words *sweet pretty creature* and are uttered in a stilted whistle. Those of alarm are like the noise made by a child's wooden spring-rattle.

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CART-WHEEL CURRENCY FROM THE CAROLINE ISLANDS.

Large limestone wheels, termed "Fei", form the highest variety of currency of the natives of Yap. The specimen pictured above may be compared with the penny inserted in the central hole, it measures three feet two inches by two feet three inches. These "coins" are quarried upon a far-off island and are brought hundreds of miles on rafts or canoes to Yap. They range in diameter from one foot to twelve feet: a hole is made in the centre so that a pole may be inserted to facilitate transportation. Size alone does not make the Fei valuable, though the larger the stone the greater is its worth; it is essential that it be made of a limestone that is white and finely grained. For "small change" the natives use trimmed flat pearl shells. (Australian Museum exhibit.)

[Photo.—*K. C. McKeown.*

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Museum Buildings

ON June 13 a deputation of the Trustees, introduced by the Honourable H. M. Hawkins, M.L.C., waited upon the Honourable the Minister for Education and placed before him the urgent need for an extension of the Museum buildings. The Minister gave a sympathetic hearing to the Trustees' views and proposals, and at his request the Government Architect has since inspected the ground, and is now examining the plans which have been prepared by Sir Charles Rosenthal and Mr. G. Blair, Trustees.

The need for increased housing at the Museum has frequently been urged in this MAGAZINE, and little remains to be said except to stress once more the urgent necessity for the taking in hand of this work at an early date.

Museum specimens can be divided into two categories: those which are placed on view for the instruction and entertainment of the public, and those which are held in reserve for consultation and study by members of the Museum Staff or by other research workers in Sydney or elsewhere. The importance of the second category, the reserve or study collections, is apt to be overlooked by those who have not a working knowledge of the objects of a museum. The truth is that from a scientific point of view these reserve collections constitute the most important part of the museum, for it is by means of these that the many problems of distribution in space and time, variation according to age, sex and season, are investigated, and without the aid of these collections it would not be possible to arrange the exhibited series in the best and most instructive manner, nor to give to enquirers the information which they desire.

Unfortunately the Australian Museum, like many others which were built about the middle of last century or earlier, was designed with the idea that *all* specimens would be exhibited. Consequently no adequate provision was made for proper storage of the reserve collections, which today are largely housed in the basement and in galvanized iron sheds, which were erected as *temporary* structures more than fifty years ago, and are, moreover, quite unsuitable for storage purposes, besides being unsightly.

As long ago as 1917 the Annual Report of the Trustees contained the following passage :

" Every portion of the building is now occupied either for exhibition, administrative, bibliographical or storage purposes, and as a result of this difficulty the affairs of the Institution are hampered, and its activities in some respects brought to a standstill. No degree of rearrangement, or interchange of duties, can alter this state of affairs. The only relief possible is to considerably extend the building, for which there are three alternative schemes in existence, and for one of these plans already drawn. Unless one or other of these be taken in hand without delay the Australian Museum will gradually lapse into that most unenviable of positions graphically described by Dr. G. Brown Goode as a ' dead museum '."

No addition of any importance has been made since these words were written and, while we claim that the Museum is still far from dead, it must be obvious that the need is greater today than it was in 1917.

Silk from Shells: An Ancient Industry

By JOYCE ALLAN.

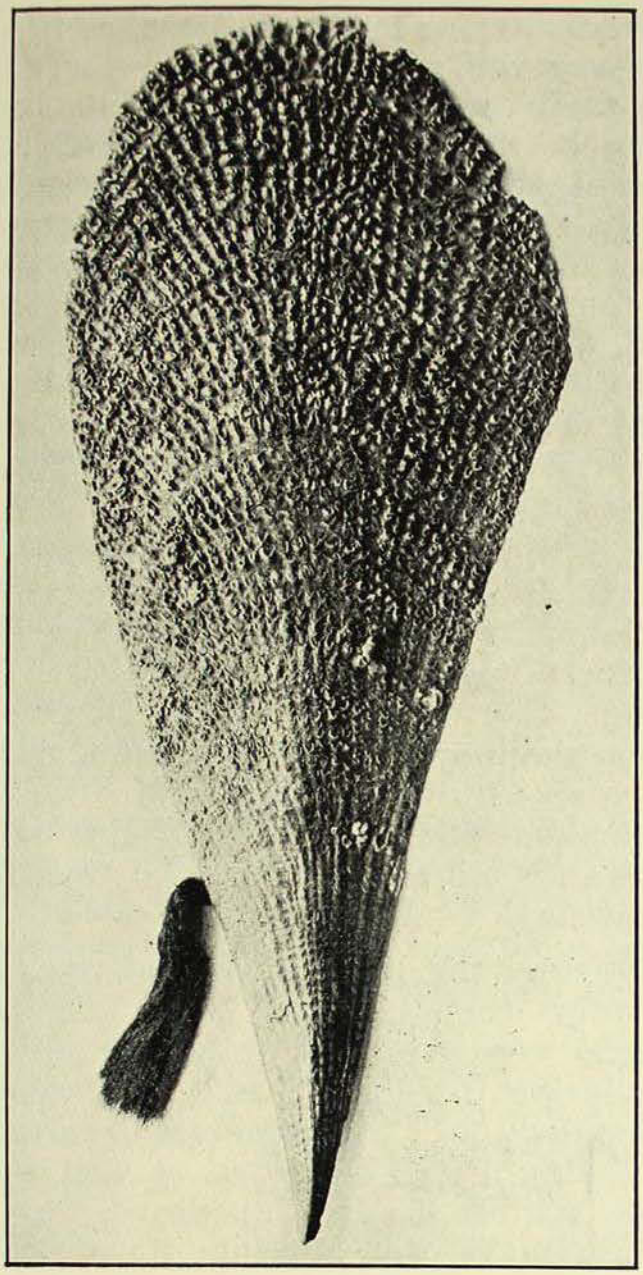
IN early times in the Mediterranean countries there was a great demand for a very fine silk cloth woven from, strange to say, a marine product. This silk, which rivalled in texture the finest made anywhere at that time, was used for manufacturing gloves, robes, stockings, and other articles of superior quality. It was known and used as far back as the days of Pliny, but as the articles made from it were too expensive for general use, the cloth was reserved for emperors, kings, and people of very high rank.

In its natural state the silk was a tuft of fine filaments by which a large bivalve shell was attached to rocks, weeds, or other shells on the sea-bottom, similar to that used by common mussels for attaching themselves to wharf-piles and rocks.

Even in its crude state, the silken threads of this byssus, as it is called, were extremely fine yet strong, of regular length, and were a rich golden brown colour; with only a slight treatment the colour changed to a brilliant bronze equal to that found on some beetles and flies, and which would respond also to any artificial colouring.

The particular shell from which the silken byssus was taken was a large bivalve almost two feet long, roughly shaped like an isosceles triangle and commonly found in great numbers a little way from the shores in parts of the Mediterranean Sea. The shells fixed themselves at their narrowest end by the byssus, and left the upper sharp edge exposed.

The method of attachment is well worth mentioning. As a spider on the land spins its web, so the animal within the bivalve is able to spin its silken threads by which it fastens itself to a secure object and so withstands any buffeting. The animal is furnished with a gland which secretes a glutinous substance. A slight pressure causes a drop of this to be deposited on a spot for attaching the byssus and by the retraction of the foot of the animal a silk thread is drawn out, and when this is repeated thousands of times the tuft of silky threads is completed. If placed back in the sea, a shell which has had its byssus removed can grow another one in its place.

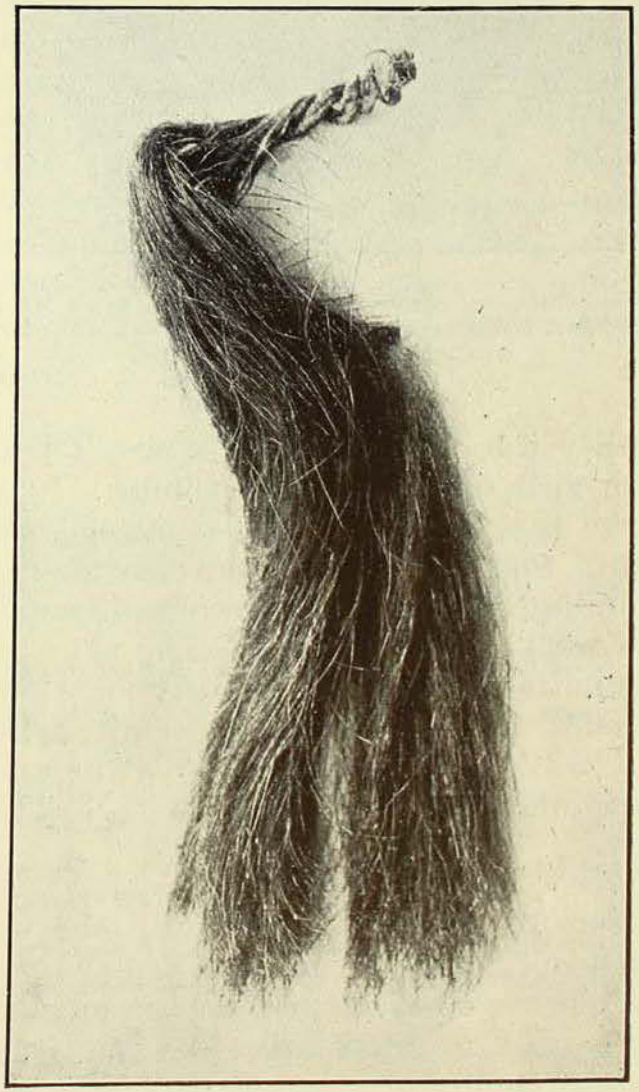


From the byssus of this species of razor shell (Pinna nobilis), silken goods were woven by inhabitants of the Mediterranean.
[Photo.—*G. C. Clutton.*

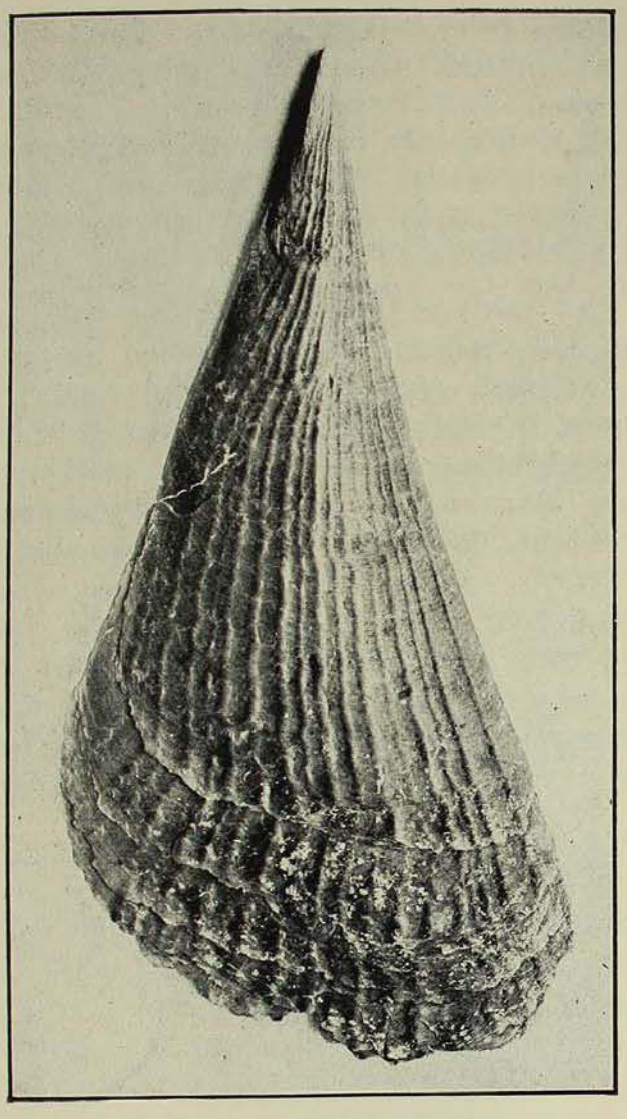
Southern Italy particularly was the scene of great activity in this silk industry, and fishermen collected the shells in enormous numbers from the shores of Sardinia, Corsica, and Sicily. Taranto was the headquarters of the industry, and the robes manufactured there from the silk were known as "Tarantine".

In gathering the shells from their resting places, the fishermen used instruments made of two semicircular iron bars, fastened together at one end but a few inches apart in the centre. At one end was a hollow band into which a pole was fixed, and at the other a ring to which a cord was attached. When a shell was sighted, the iron instrument was lowered and twisted round it and the spoil was easily brought up. The byssus was cut from the shells and sold to country women who prepared the silk for manufacturing.

The method of preparation was very simple. After soaking twice in tepid water, and once in soap and water, the silken threads were spread out to dry in a cool shady place. While still moist they were softly rubbed and separated by hand, then spread out again and left to dry. After this they were drawn through a comb with wide apart teeth, and then through a similar one but with finer more closely set teeth. That ended the preparation for the cloth in general use. When a very fine weave of superior



A typical byssus of silken threads taken from a razor shell, and now exhibited in Museum shell gallery.
[Photo.—*G. C. Clutton.*



The common razor shell found on mud flats around Sydney (Pinna menkei), which also possesses a silky byssus.
[Photo.—*G. C. Clutton.*

quality was needed, the silk was treated with still closer set iron combs. In all cases the silk was carded after treatment. Sometimes a mixture was made by spinning two or three threads of marine silk with one of real silk. The spun silk was knitted into the previously mentioned articles and after knitting each article was washed in clean water with lemon juice added, and smoothed with a warm iron.

The manufactured articles were extremely delicate, and had to be kept when not in use in fine linen, to prevent their being moth-eaten. A pair of gloves were said to fit neatly into an empty walnut shell and a large scarf in a snuff box.

Unlike the Tyrian Purple industry, which had completely died and become practically a lost art by the twelfth century, this silk industry lasted well into the later centuries, and even at the beginning of the present one cloth was still manufactured in a few places in southern Italy, though mainly because of its rarity. Possibly today occasional workers could be found there who practise this industry, and who exhibit the articles made as an example of a fine but nevertheless obsolescent textile art.

With fashion's forecast for the present year indicating that there will be more and still more variety in materials for gloves, it would be of interest to women to compare gloves made of this marine silk with those of the present times. The prices, too, would be worth comparison; when the industry was flourishing, gloves were six shillings a pair, and silk stockings about eleven shillings, which is considerably more in comparison than they are today.

During the early part of the last century goods knitted from this silk thread were exhibited at an international exhibition in London, and I believe that examples of manufactured articles, including a pair of gloves, as well as the raw material, are displayed in the Historical Section Museum, Royal College of Surgeons of England.

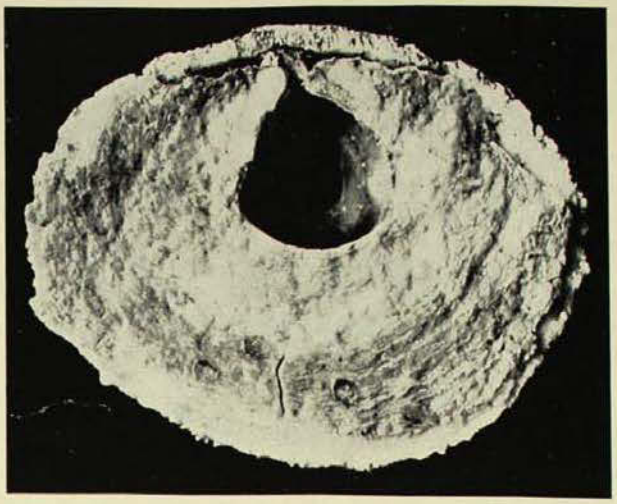
The shells producing the byssus were known to fishermen in the Mediterranean sea as "cappa lunga", and to the French as "jambon", because of their resemblance in shape to a small ham. They are not by any means confined in their distribution to that area, as they are found in warm seas throughout the world, where they have different popular names according to the country they are found in, the generally accepted one being "razor" shells. They are very thin, with tightly fitting valves, often ornamented with longitudinal ribs or erect scales. When buried in mud, with their thin outer edge only exposed, they can do much damage to fishing nets, and are also a menace to bare feet walking unsuspectedly over them.

It is interesting to note that some authorities state that the byssus of this shell was in old days an excellent cure for earache, but, as in the case of many of these old-time remedies, they utterly fail to state how it was used.

The animal in the shell was also eaten and considered quite good food by the inhabitants of the Mediterranean. It required, however, five or six hours' stewing, and even then was not as tender as the scallop. As with several of the bivalve shells, there were certain times when it was dangerous to eat this shell-fish, and this was put down to the presence of the byssus, which was always removed before the animal was eaten. To prevent any disastrous effects, the animal was usually eaten only between July and October.

Razor shells somewhat similar to those found in other parts of the world occur all round the Australian coast, and are plentiful, especially on mud-flats round Sydney, where they are attached to submarine spots by their byssus.

Other bivalves also possess a tuft of threads, probably just as silky, for attachment, of which the common mussel is the best example. A modified form of attachment, however, is exhibited by the jingle shell, the pretty, frail, brightly coloured pink and yellow valves of which are often found on local sandy beaches, and which are made into shell flowers. If a lower valve of a jingle shell is examined, a rounded hole is found towards the end where the two valves are united. Through this hole, a solid, calcified plug protrudes and attaches the shell to rocks, or other obstacles. This plug takes the place of the byssus found in the other bivalve shells.



In the jingle shell (Monia ione) the byssus is replaced by a solid calcified plug which protrudes through a rounded hole on the undersurface of the shell and attaches it to rocks.

[Photo.—*G. C. Clutton.*

Fishes and Flowers

By GILBERT P. WHITLEY.

VERY little nature lore has been handed down by the Australian aborigines to the white men displacing them, and nowadays in the cities and towns scarcely a thought is given to the original inhabitants and the creatures of land and water upon which they subsisted. Consequently, any tit-bits of natural tradition are of value today and worthy of recall, as they are so difficult to trace. One such morsel of fish-lore, the coincidence of seasonal variation in fishes and flowers observed by natives, forms the basis of this article. Old fishermen still aver that "when the apple-gum blossoms along the Hawkesbury, black bream bite at Watson's Bay", a belief doubtless originating from the blackfellows now extinct in those regions, as, in an obscure publication, the third annual report of the Acclimatisation Society of New South Wales, published in 1864, I was lucky enough to come across the following apposite observations by the old naturalist, Dr. George Bennett:

> The Australian blacks on the coast are expert fishermen and are aware of the season for particular kinds of fish, by the blooming of certain plants; for instance, when the brilliant crimson flowers of the Waratah or Native Tulip appear, it is a sign to them that the Australian Sole is to be found on the sand banks about Botany Bay and Cook's River.

According also to the flowering of other trees and shrubs, the time is known to them for the advent of the Mullet, King Fish, Schnapper, Cestracion or Port Jackson Shark, Saw Fish, &c.

In civilized England . . . When the Alder buds are developed the fishermen consider the Eels leave their winter haunts. When the wheat blossoms, the angler considers the Tench will bite readily . . .

The flowering of certain plants thus mark the appearance of various kinds of birds, insects, fishes, among the Australian blacks as among the more civilized Europeans.

Mr. Thomas Welsby, of Brisbane, has preserved some similar legends from the Stradbroke Island blacks, in his entertaining book *Sport and Pastime in Moreton Bay* (1931), wherein we read :

The poonbah or tailor fish has for its affinity the bloom or flowers of the wattle tree. If the gugarkill (the wattle) is in full bloom and colour, then plenty " poonbah " ; if no flowers, or poor colouring, poor fish . . . We can tell at a glance along the hills of Stradbroke Island whether there is going to be a good season or not, for if the wattle blossoms are not abundant then it will be a poor one ; and on the other hand, if the bush is ablaze with the yellow bloom, then it behoves us to get our nets well tarred and hardened and make ready for full boats, as there will be plenty of fish and to spare all over the bay.

The south Queensland blacks also observed that the appearance of schools of Sea Mullet in large numbers was preceded by the advent of myriads of parrots, and Mr. Welsby verified this coincidence by observations made over several years. An old native informed him, too, that the churwung or black magpie was a mate of the dungala or blackfish, and if the churwung did not come early in the winter, when the parrots had almost departed, then very few blackfish would be about. The time when oysters are at their best was known to the aborigines by the flowering of the wild hop plant.

It is said that Linnæus had a floral clock in his garden, in which flowers were planted so that the different kinds opened month by month to announce the seasons, and we see that the blackfellows, for more practical reasons, had evolved a means of reading nature's clock long before the white man's time.

The earliest reference to the flower and fish relationship which I have been able to discover in literature is the reference quoted by Willughby from Schwenckfeld's *Theriotropheum Silesiæ*, published in 1603, wherein the Tench is said to breed in spring or summer when the wheat flowers.[1]

In parts of New Guinea and the Pacific islands, natives still recognize the seasons from the life-cycles of trees and plants ; thus the time for torch-fishing, though largely dependent upon tides, may be heralded by the appearance of scarlet blossoms on a tree.[2] These illustrations do not by any means exhaust the topic of fishes and flowers, for further examples and quotations may come to light bearing on their fortuitous relationship, though nowadays the earlier empiricism is yielding ground to more prosaic scientific research. But may the day never come when the ichthyological diagram will be preferred to the Japanese painting of carp below some flowery ornament ; for it seems as if only the Japanese craftsmen have so far appreciated the artistry of fishes and blossoms, even naming one of their surf-fishes the Flower of the Wave.

A few fish have been noticed eating flowers, the Queensland Lungfish feeding on ti-tree and Eucalyptus blossoms, for instance, whilst gum leaves were found inside many flounders caught in the Hawkesbury River in February, 1927. Many fishes, of course, feed on seaweeds, the marine counterparts of flowers on land.

The natives of New Britain fix aromatic plants to traps so as to attract fish, whilst in north Queensland I have seen fish put their heads out of water which was choked with a weed called " sea sawdust " ; the aborigines explained to me that the fish had to come up to sneeze ! Bruised flowers, leaves, and roots are often used by natives to poison pools and stupefy fish, but the ancient Greeks believed that the spine of even a dead sting-ray (or " fire-flair ") could poison plants, whence the verse of Oppian's *Halieuticks* :

" If with the Fire-Flair's Spear and Hand unkind
But grate the Root, or prick the tender Rind,
The Leaves shrink in, and all the Glories fade,
Rich Sap no more is thro' the Pipes convey'd . . .
Dry Stalks now rustle on the Ground reclin'd
Where Shades once trembled at the wanton
Wind."

[1] Parit vere, et æstate, cum triticum floret—WILLUGHBY, *De Historia Piscium*, Lib. iv, 1686, p. 252.

[2] SAVILLE, *In Unknown New Guinea*, 1926, p. 66.

Tektites

By T. HODGE-SMITH.

TEKTITES ! How few Australians have ever heard the word, let alone know what it implies, although here in Australia they occur by the thousand. They are peculiarly shaped little bits of glass, seldom measuring more than an inch or so in diameter, and found in certain large but restricted areas of the earth's surface. They look so harmless, so insignificant, and yet chemists, petrologists, physicists, and geologists all over the world have been requisitioned to explain their origin. Even today, with all the resources of modern science brought to bear on the mystery, nobody has produced a solution that has definitely and finally satisfied the scientific world as a whole. Much has been written on the subject, and many and varied have been the hypotheses to account for their existence. Some have dismissed them as being artificial, others are satisfied that they are derived from volcanoes, many believe they are meteorites, while recently it has been suggested that they are derived from the fusion of rocks during a bombardment by large meteorites.

However, before discussing the various conjectures as to their origin it may be as well to learn something of their occurrence and chemical and physical properties, so that we may be better able to form our own opinion on this vexed question.

Owing to their restricted geographical distribution they have been given varietal names derived from the localities in which they have been found. From the Moldau River in Czechoslovakia we obtain the moldavites. Billitonites were first recorded from the island of Billiton, though since then they have been found in the Malay Archipelago, Indo-China, and the Philippine Islands. The name given to the Australian variety is australite, while a peculiar glass known as Darwin glass or queenstownite comes from a very restricted area about Mt. Darwin and Queenstown in Tasmania.

At first glance it would appear that these localities are scattered indiscriminately over the earth's surface, but closer inspection discloses the fact that they lie on a belt a little more than a thousand miles wide encircling the globe.

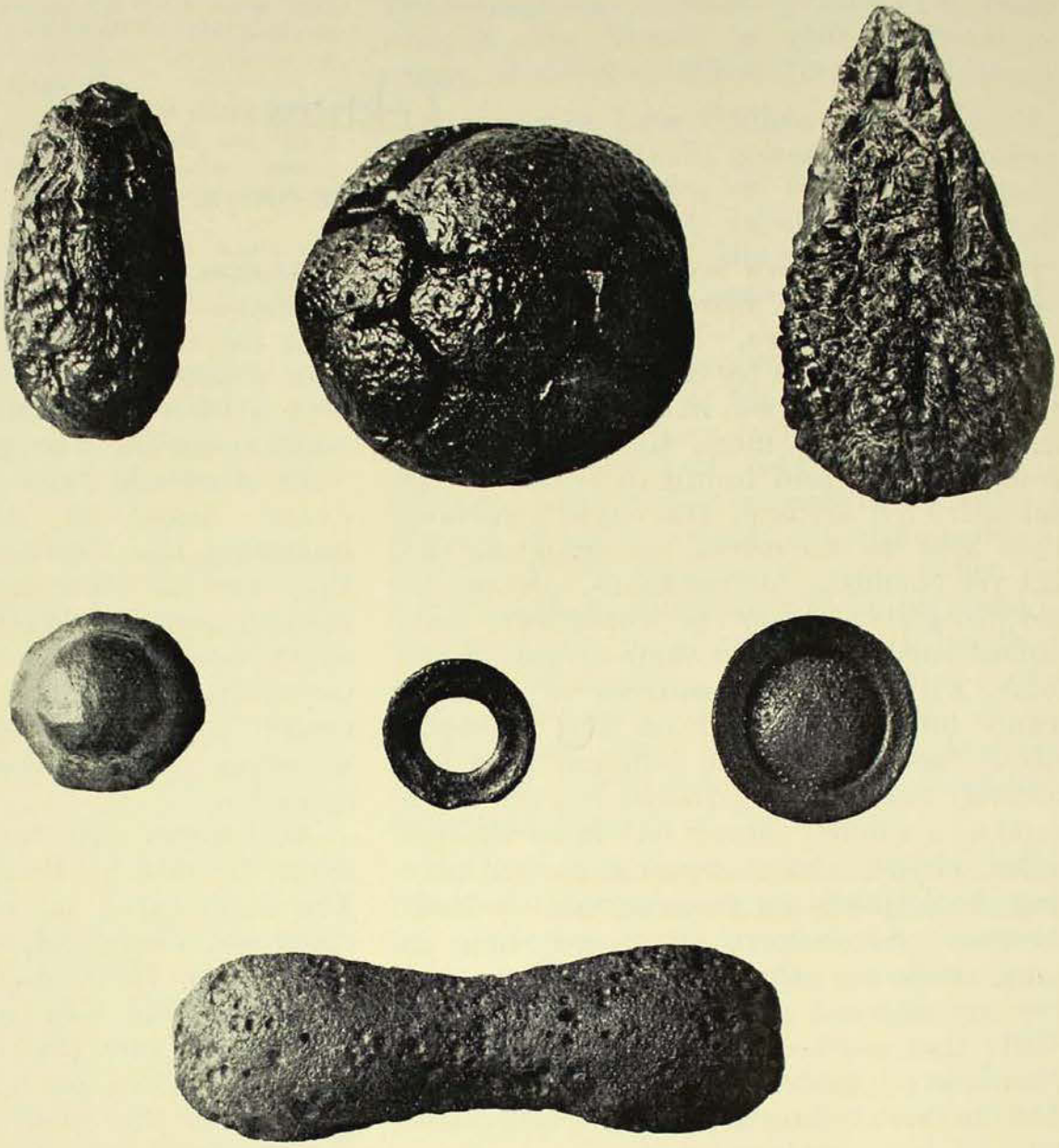
In Australia they have been found in every State of the Commonwealth, including the Northern Territory, though they are far more common in the south-eastern part of West Australia and the south-western portion of South Australia. Generally speaking, the australites are found on the surface, while the other varieties are associated with alluvial deposits.

Australites are readily distinguishable from the rest by their symmetry of form. The main types are either button-shaped, spherical, elongated, or dumb-bell-shaped and, while there do exist exceptions, it is remarkable how few they are in the many thousands that have been examined. The moldavites are bottle-green in colour, while both the australites and billitonites show colour only in thin chips and are otherwise black. The glassy material is quite amorphous, and no trace of crystallization has ever been found.

Chemically there is a distinct family relationship between all types of tektites, while it is only in extremely rare cases that terrestrial rocks are found chemically resembling them. Naturally they vary in composition, but are all characterized by a high silica content.

Tektites have always been regarded as prehistoric and as extending back into the Tertiary era, which according to the more modern estimate may be anything up to fifty million years ago. If they are being found today we would expect that, in Australia at any rate, there would be some aboriginal folklore regarding them, but there does not appear to be any record except that some tribes attributed magical powers to these objects. However, on a

trip through Central Australia some years ago I learned from missionaries and others that some tribes call them "sky-stones". In fact my prestige was greatly lowered by my attempting to throw doubts on the meteoric origin of these objects. Had not the natives seen them fall? How stupid! I began to feel as though I had attempted to prove that the earth was flat, or some such absurd proposal. There is an australite in the Museum gallery that is stated by the donor to have fallen on the roof of her homestead. Some people have explained the mysterious deaths of cattle as due to their having been hit by australites. Evidence that these little objects have appeared overnight on well-worn tracks has also been given. Obviously, in regard to the australites at any rate, it may be necessary to revise our ideas as to their age. It is very unfortunate that the areas where they are most abundant are so vast and so difficult of access, otherwise this point could have been definitely settled long ago by competent observers.



On the upper row from left to right there are a billitonite from the Island of Billiton, another from Philippine Islands, and a moldavite from Czechoslovakia; the remainder are various types of australites, including the rare ring form. All these specimens are displayed in the Museum gallery.

[Photo.—*G. C. Clutton.*

Some of the views as to their origin can be dismissed as being purely of historical interest. There are, however, three hypotheses which might be considered, one of which postulates a volcanic origin. Unfortunately not any of the volcanic glasses so far examined have the chemical composition of the tektites, and among the obsidian bombs found associated with volcanic activity we do not find the regularity of shape so characteristic of the australites. Again, in Australia the tektites occur abundantly thousands of miles from any centre of volcanic activity. To overcome this latter objection a very ingenious hypothesis was put forward, known as the "bubble theory". The shape certainly does suggest the bleb of liquid that often accompanies an ordinary bubble floating in the air. The dumb-bell-shaped variety was explained as being the result of two bubbles joined together. According to this hypothesis bubbles of lava were thrown into the upper

strata of the atmosphere, and once there would travel perhaps thousands of miles before sinking and bursting. All that would be left, of course, would be the australites, which would immediately fall to the ground. However, physicists have rather burst the "bubble theory" by raising all sorts of objections on physical grounds.

The very latest view, propounded by Dr. Spencer of the British Museum, is the result of his studies of material from the interesting craters at Henbury Station in Central Australia. The craters, thirteen in number, have been produced by the bombardment there of the earth by huge meteorites. A considerable amount of nickel iron is scattered round about these craters, and in addition some glassy material, the result of the fusion of the country rock. Nickel iron has been discovered in this silica glass, and it has been found, too, in the Darwin glass of Tasmania; there have also been noted black specks with a metallic lustre, presumably nickel iron, in certain australites. At least a similarity between Darwin glass (and most probably australites), with something the origin of which we definitely know, has been established for the first time. It would appear that a very strong case has been made out for the inclusion of Darwin glass with meteoric crater glass. But is this so with the australites? The australites cover an area of hundreds of thousands of square miles, and it is doubtful whether the crater glass of Henbury and elsewhere covers ten square miles, so that the view that Australia has been bombarded by the thousands of large meteorites necessary to produce the number of australites that have been found over this vast area needs very serious consideration. Again, if many of the australites are no older than the Henbury craters, and there is every reason to believe that this is so, we should find a preponderance of meteoric iron in the localities where the australites are found, just as we do at Henbury. This, however, is not the case.

As australites are found on every type of country rock, one would expect to find a considerable variation in their composition, because in composition the crater glass resembles the country rock where it is found.

So far we have only shown that the hypotheses do not comply with the facts, and this brings us to the meteoric theory. Again we find that the known meteorites do not in composition agree in any way with tektites. But when we consider that about twenty-five million meteors enter the earth's atmosphere every day, and up to the present only about a thousand meteorites are known, can we say that we have an average of this meteoric material that enters the atmosphere?

Those who believe in the meteoric theory depend very largely on negative evidence, but even this kind of evidence, taken in conjunction with the occurrence of australites, makes the probability of their meteoric origin much more likely and more in accordance with known facts than any other view so far put forward. If only a competent observer could verify the statement that they are still falling today, the mystery would be solved.

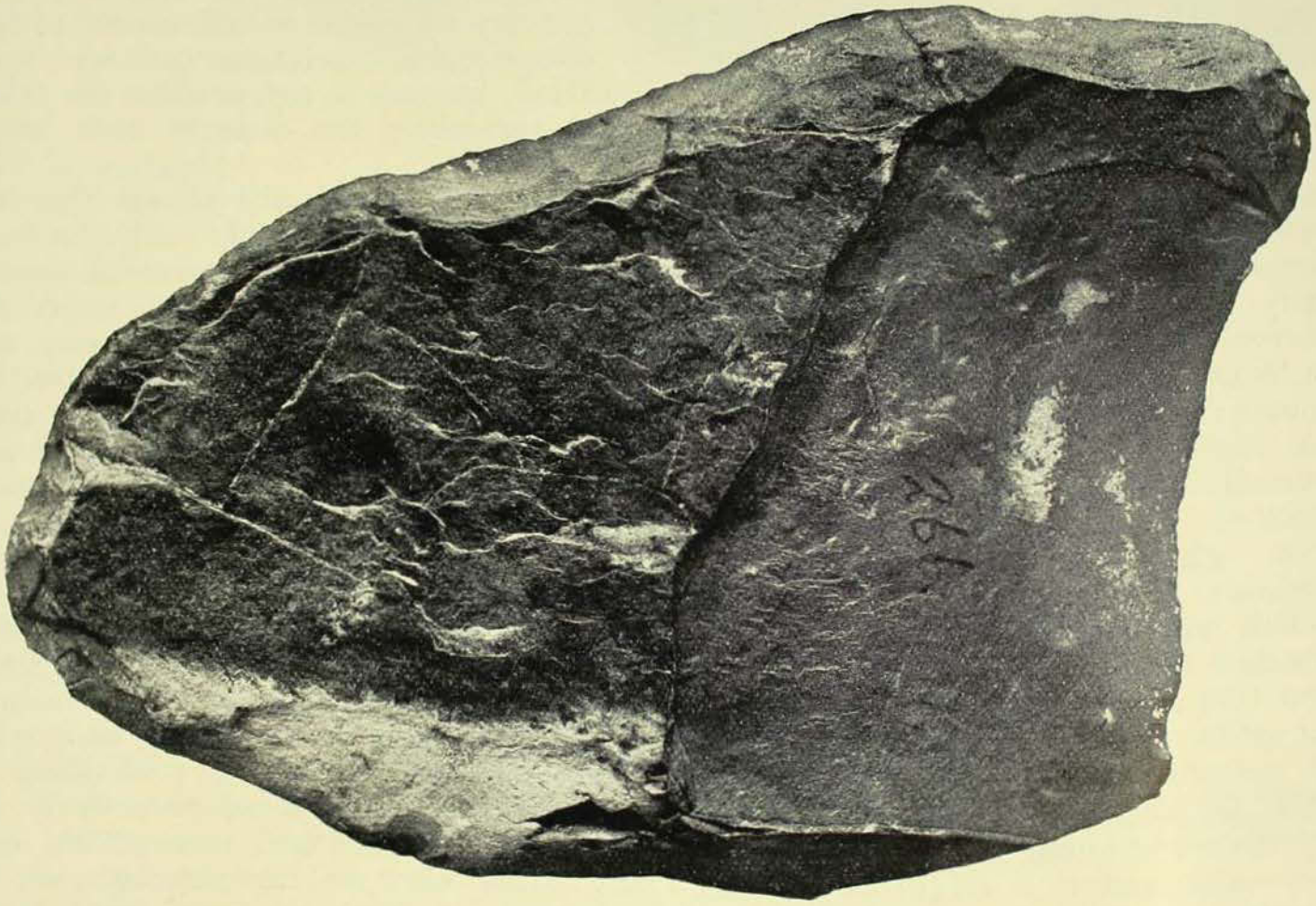
A special exhibit of remarkable fishes has been arranged at the main entrance to the Museum, and will be on display there for some weeks. Amongst the remarkable exhibits may be mentioned the following—space will not allow all to be here referred to: the Four-eyed Fish of Central America, which has each eye divided so that it can see both above and below the water surface, is shown. Then there is Australia's tiniest fish, a kind of Goby, which is fully adult when half an inch long. A Seahorse, the Leafy Sea Dragon, is displayed; this so closely resembles a tangle of kelp that it is indistinguishable when in its natural surroundings. Another fish which practises the art of camouflage is the deadly Stonefish, of which a cast and skeleton are shown. Two freak fishes exhibited are a pug-headed Flathead, in which the upper jaw has failed to develop, and a double-headed Catfish. Amongst other specimens are deep-sea fishes with luminous organs and weird eyes and teeth, the quaint Red Indian Fish, Whitebait, Flying Fish and Snapper.

A Tasmanian Flaked Axe of Unusual Size

A SPLENDID flaked axe, the tool of a Tasmanian aborigine, has been found at Dunalley by Mr. F. D. Maning, of Tasmania. The material is grey chert. The axe is eight and three-quarter inches long, five and three-quarter inches wide, almost one and a half inches through at the thickest part, and weighs two pounds seven ounces. In common with other Tasmanian implements it bears no sign of grinding or polishing, but is formed solely by the chipping of small flakes from a large flake, which was apparently struck off an outcrop. The flake was removed in such a way that the bulb of percussion is situated on one side, the working edge being formed by delicate chipping along the opposite side and on both ends.

The bulb of percussion is remarkably distinct. It radiates in a smooth broad sweep, imparting a perfect roundness to this side of the implement; no supplementary chipping was necessary.

The reverse side, illustrated above, shows the long blade; the working edge is continued round both ends to each side of the blunt butt. Half of the surface consists of the untouched and discoloured weathered rock. The outer crust of the other half appears to have been fortuitously removed to reveal the inner grey stone before the implement was shaped.



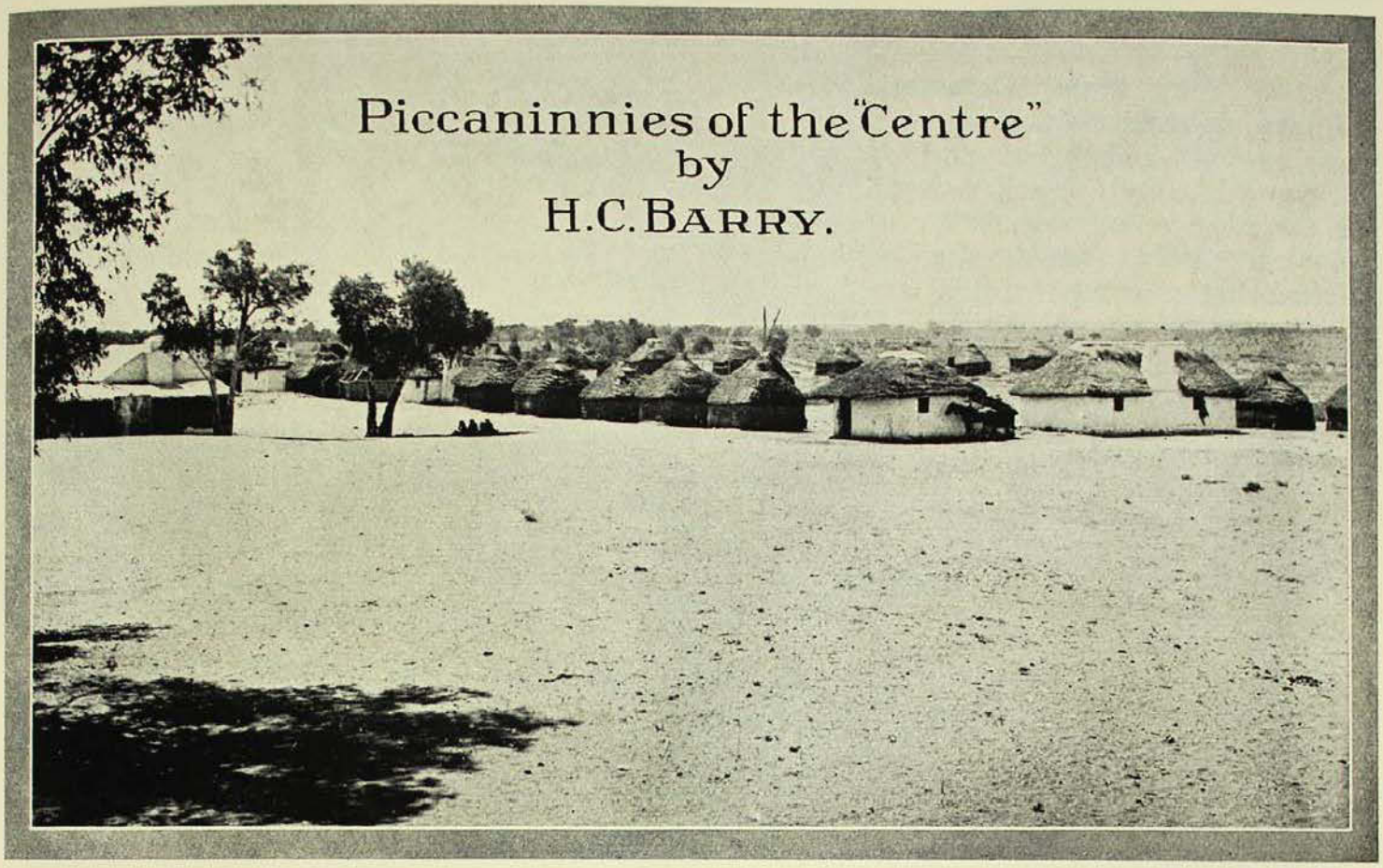
The specimen is one of the largest axes found in Tasmania, and is certainly a notable discovery. To our knowledge only one other axe exceeds it in length—and that only by a quarter of an inch. It is also tongue-shaped, and bears a striking resemblance to Mr. Maning's specimen. It was struck off in a similar fashion, and has a lateral bulb of percussion, which is not very pronounced. A cast of this axe was sent to the Australian Museum by the Tasmanian Museum in 1902. Casts of both specimens are on exhibition.

E.B.

Piccaninnies of the "Centre"

by

H. C. BARRY.



The Lutheran Mission Station, Hermannsburg, Central Australia.
[Photo.—*H. C. Barry.*

ONE cannot visit Hermannsburg without meeting the piccaninnies. From dawn till dark they seem to be everywhere, and their games and behaviour make interesting comparisons and contrasts with those of white children. Their laughter and pure *joie de vivre* expel any thoughts of loneliness that might exist eighty miles west of Alice Springs.

There is tremendous excitement when any new faces appear. After luggage, stores, and apparatus have been unpacked, and the weary visitor has found a very comfortable room and bed in one of the white lime houses, the excitement may die down. A little giggle may arouse his attention, however, and pairs of little eyes will be seen in every window and crevice of his room. A new white man is a curio, and the piccaninny makes no attempt to conceal the fact.

Most of the piccaninnies at Hermannsburg are Aruntas, the remnants of the large tribes that once lived in the country around Alice Springs. Others belong to the tribes inhabiting the vast stretch of country to the west, and have been brought in by their families.

From time to time parties of these western blacks, or Loritjas as they are called, arrive at the Mission. They are the sole inhabitants of a desolate country stretching right across to the Western Australian border, and they are amongst the last of their race that still live a happy and undisturbed existence. The fame of the white man has spread, however, right through the Centre, and parties of blacks are always being driven in by sheer curiosity to see the white man and his wonderful buildings. They leave their own domain, and after weeks of trekking from one waterhole to another reach their destination. Dozens of little wurleys on the banks of the Finke River are the only evidence left of these wanderers, for, after a few days, they are sent back to their own country before they have a chance to become too fascinated by the white man's mode of living.

These are long trips for the piccaninnies who are just old enough to walk. The

men carry only a few spears and womerahs so as to be prepared for any game, and the carrying of the babies is left to the women. They have two common ways of carrying their babies. One is to sling them across their backs and carry them horizontally, and another popular way, for the tiny ones especially, is to carry them in pitchis which are held under the mother's arm. Pitchis are wooden basins, oval in shape, which are hollowed out from the stem of the bean trees and used for mixing food or for carrying purposes when the blacks are walking about.

Pamitjakurpa, a Loritja lad, with his spear and womerah.

[Photo.—*H. C. Barry.*

There was a lad called Orbula who soon took my fancy, as he was the best collector I had. Orbula came to the Mission three years ago when he was seven years old, and Mr. Albrecht, the superintendent, told me an interesting tale of his arrival. Orbula, with his elder brother and sick mother, set out for Hermannsburg from their country, about one hundred miles to the west. His mother was sick with scurvy, and she died while they were on the way. In bad seasons all the native berries and wild desert fruits, which form an essential part of the natives' diet, die out, and scurvy is liable to develop. Many died at the Mission a few years ago before the cause—now well known to be a lack of vitamin C—was discovered and remedied. Since that outbreak the blacks have been fed on whole wheat, which contains the vitamin, and there has been no further trouble. After their mother died the two boys pushed on, and eventually reached Hermannsburg one night. One must realize that travel in this country depends entirely on a knowledge of the waterholes, which are often a day's march from each other. It is amazing how the natives, and especially young lads as these were, can find their way across country they have never seen before. Mr. Albrecht heard of their arrival, and went down to the Finke bed early in the morning. He found Orbula cheerfully running over the sand hills catching lizards for himself and his brother. They were both very weak, both were bleeding freely from their gums, and Orbula's brother died

Some of the Mission girls; all are full-blooded Aruntas.
[Photo.—*H. C. Barry.*

from scurvy a few days after they arrived.

Orbula is now ten, and with many others used to collect for me during our stay. They would follow the tracks of lizards and small mammals over the sand hills, dig them out, and then come looking for oranges as a reward. The sand hills teem with lizards, so our orange supply did not last nearly as long as we expected. Nothing appealed to me more than their skill in tracking on the sand.

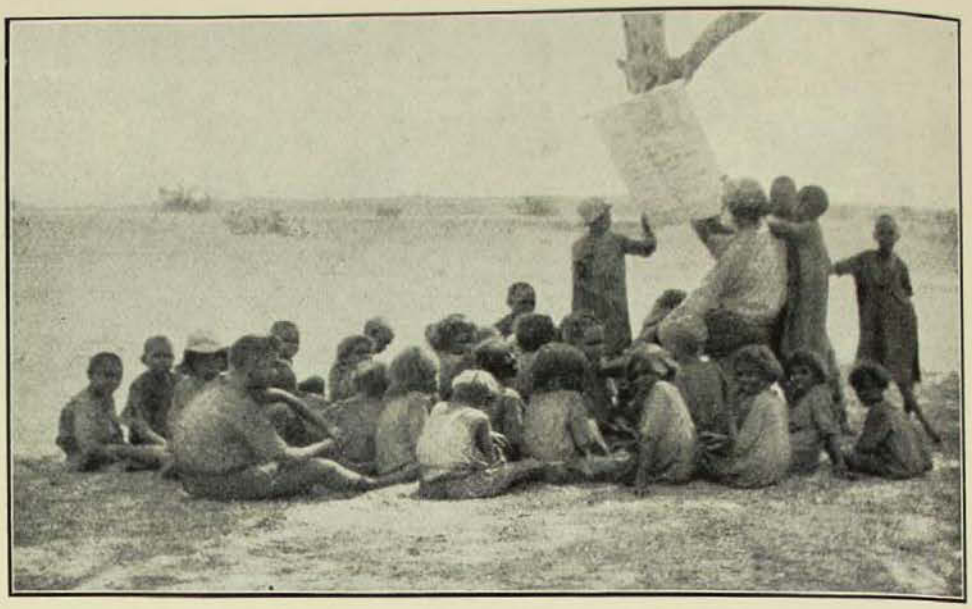
There was a little Mountain Devil (*Moloch horridus*) which I was keeping in a box for a few days. These lizards get their name from the horny spikes which cover their bodies, but they are quite harmless creatures, living solely on small black ants. One day I saw that the Moloch was gone, so I called some piccaninnies over and said, " Endarkuma, him get away ". They soon started running over the sand, pointing out something every few yards and found the lizard about one hundred yards away. The sand had been trampled on by hundreds of blacks and cattle, and I could barely make out a faint track when it was pointed out, much less distinguish it from all the other markings. It is difficult for a white man to realize the skill they acquire in reading the tracks of all creatures that live on the sand.

Almost as soon as they could walk they would practise throwing little bits of bark, and amongst the schoolboys sham boomerang fights were very popular. Each piccaninny had a little shield and about six pieces of dry gum-tree bark. Everyone had a shot at every one else, and they were marvellous in ducking and warding off the missiles with their shields. At other times the boys used to go out practising with their wooden boomerangs. These are similar to the large adult boomerangs, but are a little smaller. The boomerangs in the Centre have only a slight bend, and are not built or meant to return when thrown. They are hurled at the ground, and run in a circular fashion over the sand at a great speed, and are used mainly to kill rabbits and other small animals; euros, kangaroos and emus are usually

Some of the Mission boys playing and practising with their boomerangs. Orbula is second from the left.
[Photo.—*H. C. Barry.*

speared. The piccaninnies who were too young to use a real spear and womerah practised with grass stems and had some great fights among themselves, which were just as willing and skilful as those with the bark boomerangs.

The little girls were shyer than their brothers and spent most of their time giggling and peering round trees and fences. We were each given the name of one of the familiar animals. I was nicknamed "Elanger", which is the name of the Racehorse or Cycling Lizard (*Amphibolurus* sp.), a fact which seemed to be a source of endless amusement, though I failed to see why. The older girls used to milk the cows, and many were taught to sew quite well.



An English lesson at Hermannsburg. The teacher is an old Arunta native known as Abel.

[Photo.—*H. C. Barry.*

One night about ten Loritjas arrived with their families. They camped on the Finke bed, but came up to exchange their spears and ornaments for food and, above all, for some clothes. A black prizes a white man's clothes far above everything else, though he has no idea of their use. I exchanged an old pair of slippers with one old warrior for all his sacred churingas and bullroarers, and it was noteworthy of the ten men that a week after, when they had procured all the clothes available, six had waistcoats, but only two had trousers. In the Loritjas' wurleys, which consisted of only a few gum tree branches placed side by side, were many piccaninnies. They were shy little creatures, and their thick matted hair was quite distinct from that of the Mission lads and lasses, who had their hair occasionally cut and combed, respectively.

The Mission lads were very proud of their hair, and I soon found that a great deal depended on the way it was cut. The boys in the lower classes had the clippers periodically right over the top, but those in the top class were allowed a tuft in front, and when they passed this class, were allowed a normal cut. One day when the barber, who is also the school teacher, was doing the rounds there was a terrible commotion, and I found Orbula tearfully hanging on to his front tuft, which was shortly to be lost as he had failed to pass from his former class. After a few combs the hair of the Mission girls looked quite respectable, and several of them, though full-blooded Aruntas, had blonde-tipped hair.

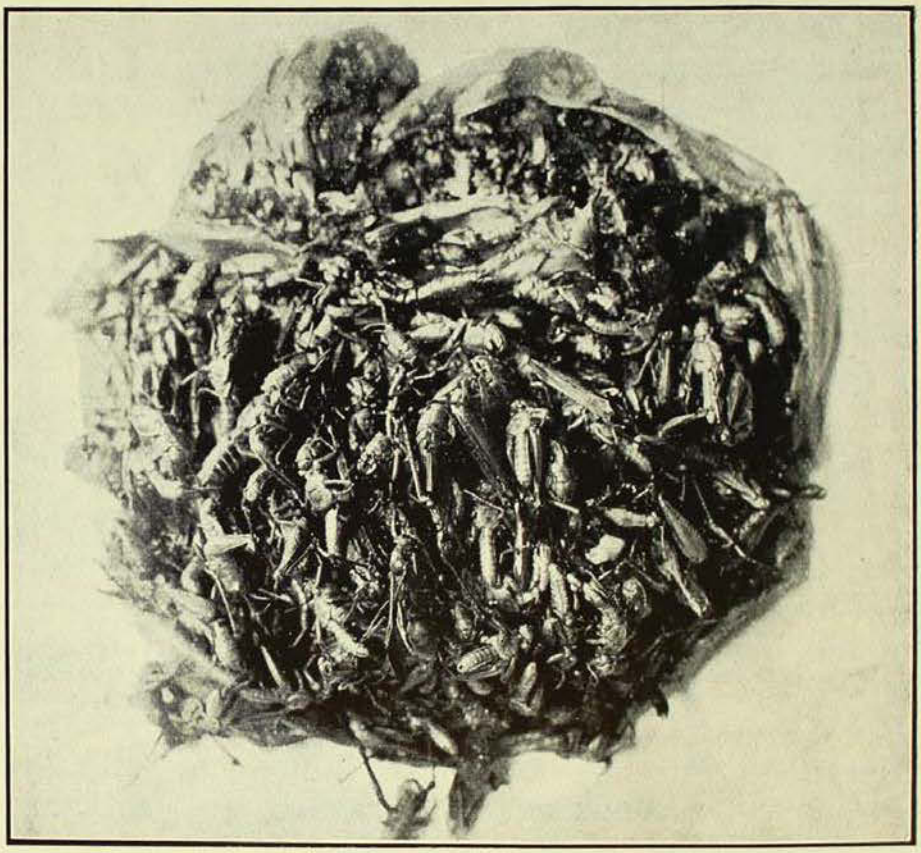
School at Hermannsburg is very amusing. An attempt is made to teach the boys English and a little arithmetic, so that they may be able to take on jobs as stockmen in later life. Their religious tuition is given entirely in the native Arunta tongue There was an old Arunta native called Abel who could speak only a few words of "pidgin English", but I found him one day in the rôle of English teacher He had a class of about twenty squatting on the sand in the shade of a small gum tree He would say a word, and then the whole class would chant it together. Their attempts at learning English are not very successful.

A few are able to do useful work about the Mission when they grow up. There are drivers for the donkey and camel teams, shepherds for the flocks of sheep and goats, several stockmen, and an excellent carpenter. It is at hunting, however, that they excel. Not only have they inherited a love for the chase, but they have devoted their lives to the study of the tracks of all animals and to the use of their boomerangs and spears.

The Food of Trout

By KEITH C MCKEOWN.

THE food of trout may, at first sight, appear to have but little interest for the general reader, who very possibly will say " Who cares what they eat, and what does it matter, anyhow ", although he would perhaps be quite definite that the trout themselves are undoubtedly excellent eating. Maybe there was something of this feeling in the mind of the writer when he first undertook the investigation of the food of trout in Australia, but the work soon proved to have quite a fascination of its own.



Stomach of Rainbow Trout from Big Badja River showing condition of contents when opened.

[Photo.—*G. C. Clutton.*

The reason for an investigation into the food of these fish may seem far to seek, but it actually has a very practical application. Trout (*Salmo irideus* and *S. fario*) have been introduced into this country at considerable trouble and expense to provide sport for the angler, and incidentally to enhance the attraction of certain districts as tourist resorts. New Zealand and Tasmania, where trout have also been introduced, depend for no inconsiderable part of their tourist traffic upon trout fishing, so that it has become an asset of considerable commercial value to the countries concerned.

Prior to the publication of a paper on the subject in the *Records of the Australian Museum*[1] no work had been done in this direction in Australia, although investigations had been carried out in New Zealand over a period of several years in a very efficient manner. It was found that in certain streams in New Zealand the fishing was becoming poor, and the fish themselves deteriorating in quality and size. What was the reason for this decline? This was the first problem which the investigator had to solve, and it was found that the suitable food, mainly aquatic insects, was being eaten up by the fish much faster than it was able to increase and, in the case of certain species, it appeared only a matter of time before they disappeared from the streams altogether. As a result of the work carried out action is being taken in some of the affected streams to restock them with small fish and insect life suitable for trout food.

[1]MCKEOWN: *Rec. Aus. Mus.*, xix, 2, 1934, pp. 141-152.

Principal contents of same Rainbow Trout stomach after sorting showing grasshoppers, dragonfly nymphs and other insects, together with a quantity of broken remains.

[Photo.—*G. C. Clutton.*

The same condition is beginning to appear in some of the Australian trout streams; there are many fish, perhaps too many, for the food supply available, with the result that the fish, although they are of fair age, increase in size and weight little or not at all. Unless early action is taken to rectify this condition the fishing in these streams will become little short of hopeless. The fishing in other streams, too, will probably deteriorate in a similar manner, so that it will be seen that a knowledge of what the fish are actually feeding upon is essential for the well-being of our trout streams.

It is not sufficient to "believe" that the fish are feeding on this or that; an examination must be made of the stomach contents, the final court of appeal, which gives conclusive proof of their food. When an insect or other animal has been swallowed by a fish, it is some time before the digestive juices begin to act upon it, so that a large proportion of the stomach contents are not only recognizable, but some have been in such perfect condition that they have been mounted and placed in the Museum collection. Many insects and crustaceans have a hard horny covering, which resists the action of the digestive juices, so that, where fragments only remain, these are often quite recognizable, and permit one, in this post mortem, to determine at least the family to which the deceased belongs.

Considerable interest also attaches to the composition of trout food from a purely biological point of view, since the trout is an exotic species introduced into a strange environment, with consequent reaction upon the native fauna and disturbance of the balance of nature which has been so marked in the case of certain terrestrial animals imported into Australia. We have, as yet, no knowledge of a definite nature of the effect upon the aquatic

fauna of those streams in which trout have been liberated.

When the stomach of a fish is first opened there appears to be just a hopeless jumble of heads, tails, and legs, but as these are sorted out and identified some sort of order begins to appear out of the chaos and, in fact, so typical are many of the insects that the investigator, even if he has never seen the stream in which the fish were taken, can almost picture the scene of its capture and even, perhaps, the kind of vegetation; whether the stream flowed between bushy banks; whether the bottom was rocky or muddy, and so on.

Here are the contents from a typical Rainbow Trout (*Salmo irideus*) taken in the Goodradigbee River, New South Wales, in December: 16 Scarabæid beetles (*Phyllotocus navicularis*), 3 Scarabæid beetles (*Heteronyx* sp.), 1 beetle (*Cisseis* sp.), 1 beetle (Dryopidæ), 1 weevil (Curculionidæ), 2 Scarab beetles (*Onthophagus* sp.), 8 water beetles, 2 Carab beetles, 3 beetles (*Tomyrus* sp.), 1 Mordellid beetle, 33 Rutherglen bugs (*Nysius vinitor*), 2 Jassids, 1 plant bug (Pentatomidæ), 1 Ichneumon wasp, 2 ants (unidentifiable), 1 bee (*Halictus* sp.), 1 Braconid wasp, 1 Thynnid wasp, 1 grasshopper (immature), 4 caddis cases, 1 moth (unidentifiable), 3 Neuropterous larvæ, 1 fly, 1 Gordian worm, 4 spiders, and a large quantity of insect remains so finely broken as to be unidentifiable—quite a varied menu. Then again we may find the stomach to contain only a little sand and gravel, or even completely empty, the fish having evidently struck a thin time.

The food of trout varies according to weather conditions, the vegetation bordering the banks of the stream, and even the nature of the stream itself. In some seasons one insect may be plentiful, in others another. If the weather is bright and sunny, beetles, ants, flies, *et cetera*, will be plentiful; if dull and wet, the terrestrial insects will not be so much in evidence, and more aquatic creatures will be eaten by the fish.

The most popular item on the trout's menu is caddis worms, as many as 781 caddis cases being found in one stomach. The caddis larva, being a defenceless creature, builds a protective case of sand, pebbles, sticks, or other objects in which to shelter, but these cases seem to offer little protection from the trout, since they swallow them cases and all. The sluggish dragonfly larvæ, popularly known as "Mud-eyes", which are found in the mud of streams, are also relished by the fish, and are eaten in large numbers, as are also the slender nymphs of the Damsel flies, from among the water weed. The dragonflies themselves are also eaten by the fish, sometimes in large numbers, apparently where the insects have been entering the water to deposit their eggs. Mayflies are taken by the fish, but on account of their fragile nature are readily digested, and are eaten much more extensively than is indicated in the results of the investigation.

Ants are readily eaten, and form the predominating item in some of the stomachs and, since the majority of these insects found are winged males and females, they are evidently captured during their nuptial flights, the ants falling into the water and being devoured as they struggle; many of these honeymoons must be brought to an untimely end by the trout. In the case of one large specimen of Bull-dog ant (*Myrmecia gulosa*) it had been swallowed while living, and its mandibles were so deeply embedded in the stomach wall of the fish that it required considerable force to disengage it. Since these ants are possessed of a long and extremely potent sting it is probable that it made its presence felt in no unmistakable manner, and the reaction of the fish to the latest acquisition in its meal may be imagined.

The surface of the water seems to provide a prolific dining table for the trout, since many insects fall or are blown from the surrounding vegetation into the stream, where they are snapped up by the fish as they struggle in a vain effort to escape. Bees, wasps, bugs, and flies meet their end in this manner. The little brown Scarabæid beetles, so common in the summer months around the tea-tree blossoms, are devoured in hundreds, and grasshoppers, especially while immature and wingless, meet the same fate. A total of 267 grasshoppers, all practically intact,

together with a large quantity of broken remains, was taken from the stomach of one Rainbow Trout (facetiously dubbed "Greedy Willy" from his appetite) from the Big Badja River—surely a wonderful meal for any fish!

The aquatic insects, water beetles and their larvæ, water boatmen and other water bugs, aquatic larvæ, and the myriad of insects living in the streams all pay their toll to the fish.

Fresh water Crayfish or "Yabbies" (*Parachæraps bicarinatus*) and shrimps (*Paratya australiensis*) form no small portion of the trout's diet, and in the case of the former they leave a ready means of estimating the number eaten in the hard limy gastroliths, which remain in the stomach of the fish long after their bodies have been completely digested. Fresh water snails, chiefly *Bullinus* sp., have been found to be largely eaten by the fish, which are by no means fussy in their meals, and swallow them shells and all. Frogs and small catfish have also been found, as also were the bones of a small mammal, probably a mouse.

It will be seen that, although the fish have their preferences in the way of foods, there is really little that comes amiss as a meal to the trout, and it would appear that any small living creature is liable to be devoured, should it be luckless enough to cross the path of a hungry fish.

Reviews

WHALEMEN ADVENTURERS. By W. J. Dakin, D.Sc., F.Z.S. (Angus & Robertson Ltd., Sydney, 1934.) Royal 8vo., pp. ix+263. Price 15s.

This book, in which Professor Dakin tells the story of southern whaling from the days of sail to modern times, is written in such a breezy, not to say rollicking, style that it is likely to hold its own with the most popular "thriller" of them all. The subject is an extraordinarily interesting one, and the author, who is himself a bit of a sea-dog, with first-hand experience of whaling, has written with gusto, importing the appropriate flavour and atmosphere; indeed he does not disdain the use of a mild swear word here and there.

But it is also evident that much research has gone to the making of this fine work. The author has consulted many log books, old letters, and other original sources of information, and this saga of the whalemen is also a splendid contribution to the early history of the Australian colonies, in the settlement of which the whalers played no mean rôle. Many fascinating glimpses of people and events of these olden and strenuous times are contained in the work, and long dead and gone skippers, "harpooneers", and plain sailor men live again in its pages. They were a hardy and courageous race; they had to be, for their calling was a dangerous and arduous one. How different it is today, when the harpoon gun, the factory ship, and the chasers have made whaling a more or less safe industry—except for the whale.

One of the most interesting chapters in the book is that entitled "Whaling Extraordinary at Twofold Bay", in which we are told of the unique co-operation of whale-hunters and Killer Whales. Professor Dakin came to Twofold Bay not to scoff, but in a state of honest doubt regarding the tales he had heard, and came away convinced that until recently a pack of Killer Whales had paid yearly visits since 1843 and had assisted the whalers to round up and slay the whales. Nay more, "Old Tom", the best known of the Killers, has been recognized year after year for at least fifty, and possibly eighty, odd years. The end of the Killer pack is not without its pathos. In 1928 only "Old Tom" and "Hookey" were seen; thereafter "Old Tom" alone appeared,

and in 1930 his carcase was found washed up on the beach. With loving care his body was stripped and his skeleton skilfully mounted in a manner worthy of professionals; it is now exhibited in a building in the main street of Eden—surely the most fitting resting place for his bones.

The printing and get-up of the book are excellent, and the illustrations are well chosen and reproduced.

C.A.

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OLD DAYS : OLD WAYS. By Mary Gilmore. (Angus & Robertson, Ltd., Sydney, 1934.) 8vo., pp. vi+270. Price 6s.

In this book of reminiscences Mrs. Gilmore writes fluently and entertainingly of people and happenings, of hardships and brave deeds, of kind actions and cruelties. Gifted with great powers of observation, a remarkable memory, and an understanding and sympathetic mind, the author gives us vivid impressions of the pioneering days of her youth, and of the dauntless men and women who battled with the wilderness—and sometimes lost. She writes of the days when on Australia's frontiers a pair of scissors was a prized possession, and nails so rare that the children dressed them up and used them as dolls. We have, too, illuminating and amusing sketches of old Sydney, of fashions for ladies and gentlemen (and policemen), of the snuffing habit, in which even ladies of quality indulged; "common people like seamen chewed; all classes in some degree smoked; but gentlefolk took snuff"

From the scientific point of view the book is not without interest and value, especially the chapters dealing with the life and customs of the aborigines, their devices for increasing and conserving animal life, their methods of catching fish, counting, and telling the time. In view of the general impression that the aborigines took no steps to increase plant food, anthropologists will be intrigued to read Mrs. Gilmore's account of their planting of seeds, and the careful selection of the best and most useful.

In the chapter headed "The Cuckoo", an incident is recorded which will be of great interest to ornithologists. The manner in which the egg of the cuckoo is deposited in the nest of another bird has long been a subject of discussion. It seems that some cuckoos sit on the chosen nest and lay their egg within, while others convey it by means of beak, or more rarely claw. But Mrs. Gilmore relates that she once observed how the invader swooped on a swallow's nest, "measured space, time, and height; hovered an instant with beating wings; pivoted; turned and shot the egg backward into the nest". This method, so far as is known, has never been recorded before.

C.A.

In continuation of the policy of the Trustees of this Museum to bring the Institution into close contact with various centres, collections are prepared for distribution to schools. These collections are completely labelled, each object bearing its scientific, as well as popular, name, together with general information. A more detailed account is also prepared to assist the teacher in class work. These collections, in many instances, are the means of inland children acquiring some knowledge of our marine creatures. Such collections, too, form the nucleus of a school museum.

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Mr. Melbourne Ward, F.Z.S., of Lindeman Island, *viâ* Mackay, the Great Barrier Reef, continues to assist this Museum with excellent material, accompanied by copious field notes. Mr. Ward has established a zoological laboratory upon this island to further himself in his research work. Mr. Ward is well known for his carcinological studies.

Notes and News

MR. ROLAND V. OLDHAM, now living on Yule Island, Papua, is a frequent correspondent, from whom we receive natural history and ethnological specimens, as well as photos, in the taking of which he is very skilful. The natives of Yule Island belong to the Roro tribe, the dandies of Papua, and in this issue we reproduce three of Mr. Oldham's photos, showing a youth and maiden of the tribe in all their finery.

This maiden of the Roro tribe (Central Division, Papua) has now reached adult state. She is covered with many valuable ornaments of polished shell and boars' tusks, with dogs' teeth necklaces and exquisitely carved tortoise shell discs so frail that they are set in a protecting circle of shell. Her armlets are of polished sections of shells, and she wears in them aromatic leaves. The ornaments are not all her own ; her family has presented her with some which she will keep, but the rest have just been lent for her ceremonial parade. After five days of display the borrowed ornaments are returned. Henceforth the young woman may join in all the village dances, and may receive suitors for her hand.

A Roro youth stops by the wayside to perfect his toilet. He is using a comb, which resembles a many-pronged fork, to fluff out his luxuriant woolly hair. In his armbands are fragrant leaves, which are believed to have the power of drawing admiring glances from the village maidens.

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Recent visitors include Miss Evelyn Cheesman, on her return from Papua, where she had been collecting zoological and botanical specimens for the British Museum; Dr. A. L. Rand and Mr. R. Archbold, on their way from New Guinea, where they collected mammals and birds for the American Museum of Natural History; Dr. Carl C. Caldenius, the distinguished Swedish geologist and authority on glaciation periods.

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On May 4 Messrs. H. O. Fletcher and E. L. Troughton left for an extended trip in Queensland, where they will collect chiefly fossils. From letters that have since been received from them we learn that they have been successful in collecting large series of fossils, and have also secured a number of mammal, bird, reptile and other specimens.

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The Museum benefits considerably by the efforts of volunteer collectors in various parts of the Commonwealth and in the Pacific islands. These are provided with collecting cans, preservatives and other gear, and are given instructions on methods of collecting. Sometimes the cans or other material, which are subject to accidents by flood and field, resemble the raven and never return to the ark, but in most cases our luck holds. Father J. B. Poncelet, of the Catholic Mission, Buni, Bougainville Island, was in Sydney some months ago, and kindly offered his services as a collector. He was supplied with the necessary material, and has recently forwarded to the Museum an excellent and well preserved series of mammals, reptiles and other specimens from Bougainville. As we previously had very little material from this island, this consignment is of particular value, and we are greatly indebted to Father Poncelet for his voluntary efforts in the service of the Museum.

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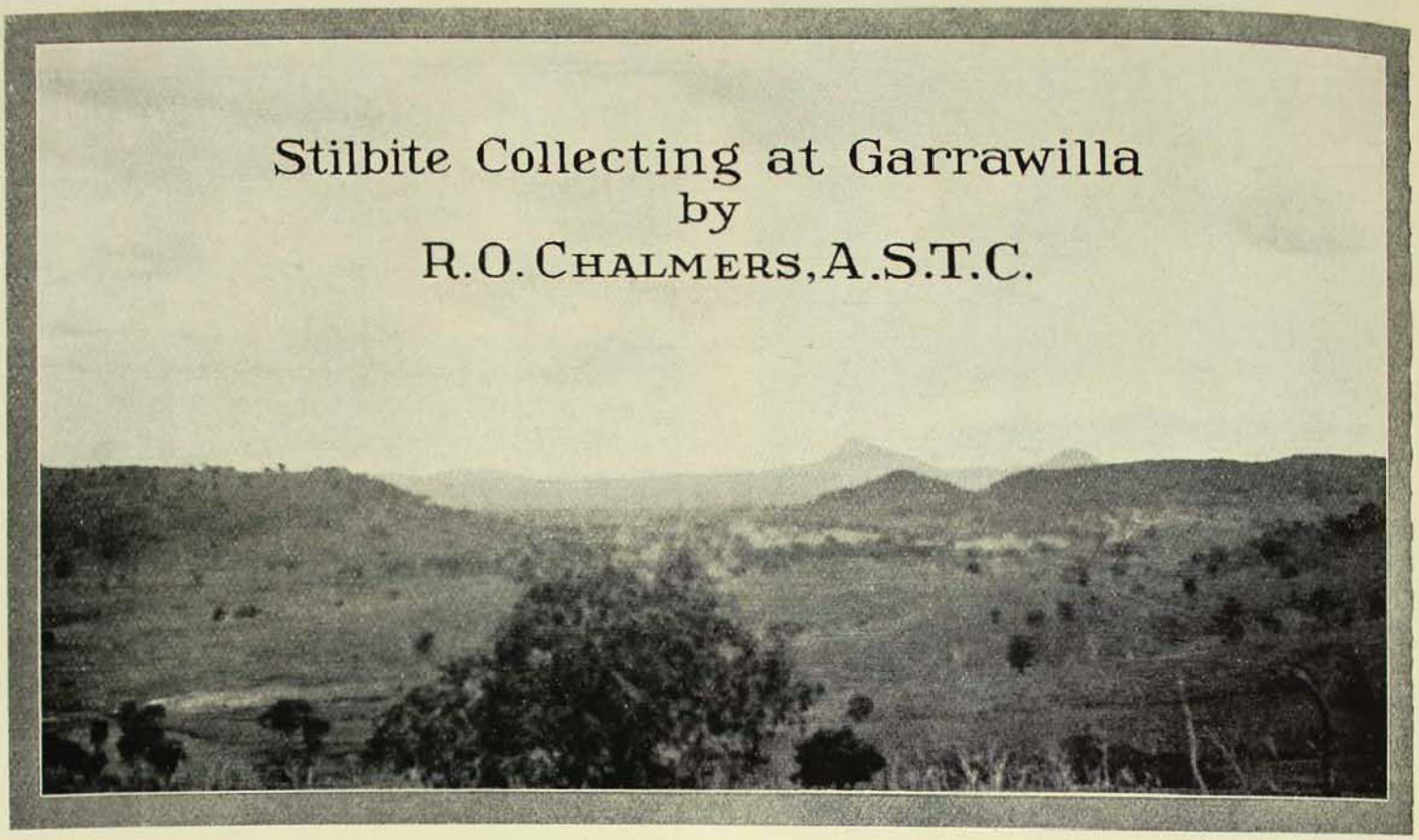
A third edition has just been issued of McCulloch's *Fishes and Fish-Like Animals of New South Males*. This work contains illustrations of most of the 630 different species of fishes now known from this State. It is procurable from the Royal Zoological Society of New South Wales, Box 2399MM, G.P.O., Sydney, price 2/6, postage extra. The first edition appeared in 1922, and the additional species made known since then are listed in a supplement by Mr. G. P. Whitley included in this edition. Game fishermen will be interested in the fact that the Striped Marlin Swordfish is here officially added to the list of Australian fishes.

Stilbite Collecting at Garrawilla

by

R. O. CHALMERS, A.S.T.C.



Panoramic view, taken on a rainy day, from the eastern boundary of Garrawilla Station, showing the valley of Girrawillie Creek. The basalts of the Garrawilla series form two long ridges on each side of the valley, while the alkaline peaks, Kiadmoot and Talbareya, stand sharply against the sky-line.

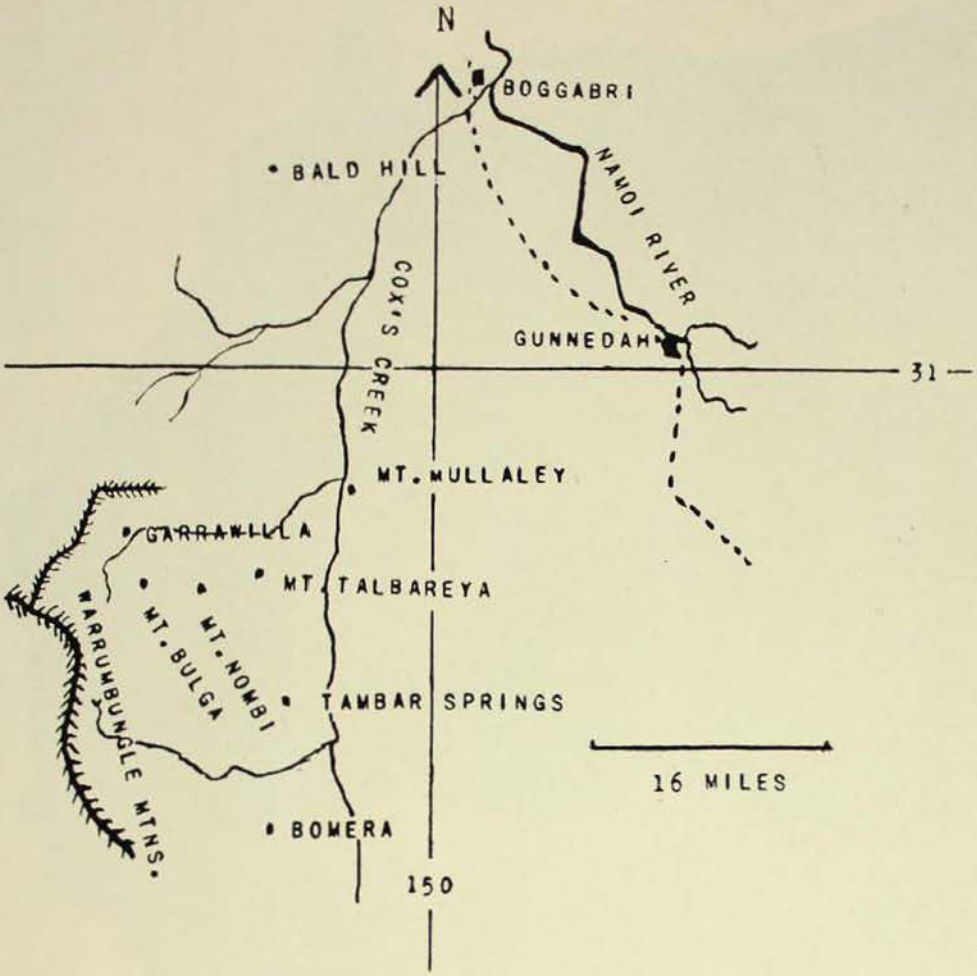
[Photo.—*R. O. Chalmers.*

HISTORY OF THE FIELD.

STILBITE, one of the zeolite group of silicate minerals, is of great interest in New South Wales in that it has a very extensive occurrence in the Garrawilla district and that it was noted and collected in the early days of the colony. In fact, with the exception of minerals of obvious commercial importance such as coal and gold, it was probably one of the first Australian minerals to create keen scientific interest, if one also excepts the material known as Sydneia, which was taken to England by Sir Joseph Banks, but on analysis proved to be only a common clay.

In 1853 the Rev. W. B. Clarke and Samuel Stutchbury were probably the only two trained geological observers in the whole of Eastern Australia. Stutchbury, an Englishman and, I think, a native of Bristol, was officially designated Geological Surveyor, and apparently received his appointment not long prior to 1851. Since little is generally known about this fine worker, what few details I can find about his career will not be out of place in this article. In England in 1825 Stutchbury happened to see some fossil teeth that had been discovered by Dr. Gideon Mantell in Sussex. Some workers suggested that they were the teeth of a fish. Cuvier held that they had belonged either to a rhinoceros or to a hippopotamus. Stutchbury, however, pointed out their resemblance to the much smaller teeth of the present day iguana, and this suggestion led to a further examination, and they were finally pronounced to be the teeth of a dinosaur, one of those extinct giant reptiles. The animal was given the generic name of *Iguanodon*.

He came to Australia some time between 1825 and 1830, and the next event of interest that we know about him was that he was with a dredging party in Sydney Harbour when the first living specimen of *Trigonia* ever found was brought to the surface. *Trigonia* is a bivalve that up to that moment had been known only as a fossil in any part of the world.



Unfortunately, no sooner had Stutchbury placed the animal on the seat of the boat and had observed it to be such a rarity than in the perverse manner of most rare things it leapt overboard, if one can imagine an oyster-like animal leaping at all. Another individual was not found for years.

More to the point, however, Stutchbury made several arduous though important trips into many rugged and inaccessible parts, both of this State and of Queensland, and it is with his observations made on one of these trips that we are concerned here.

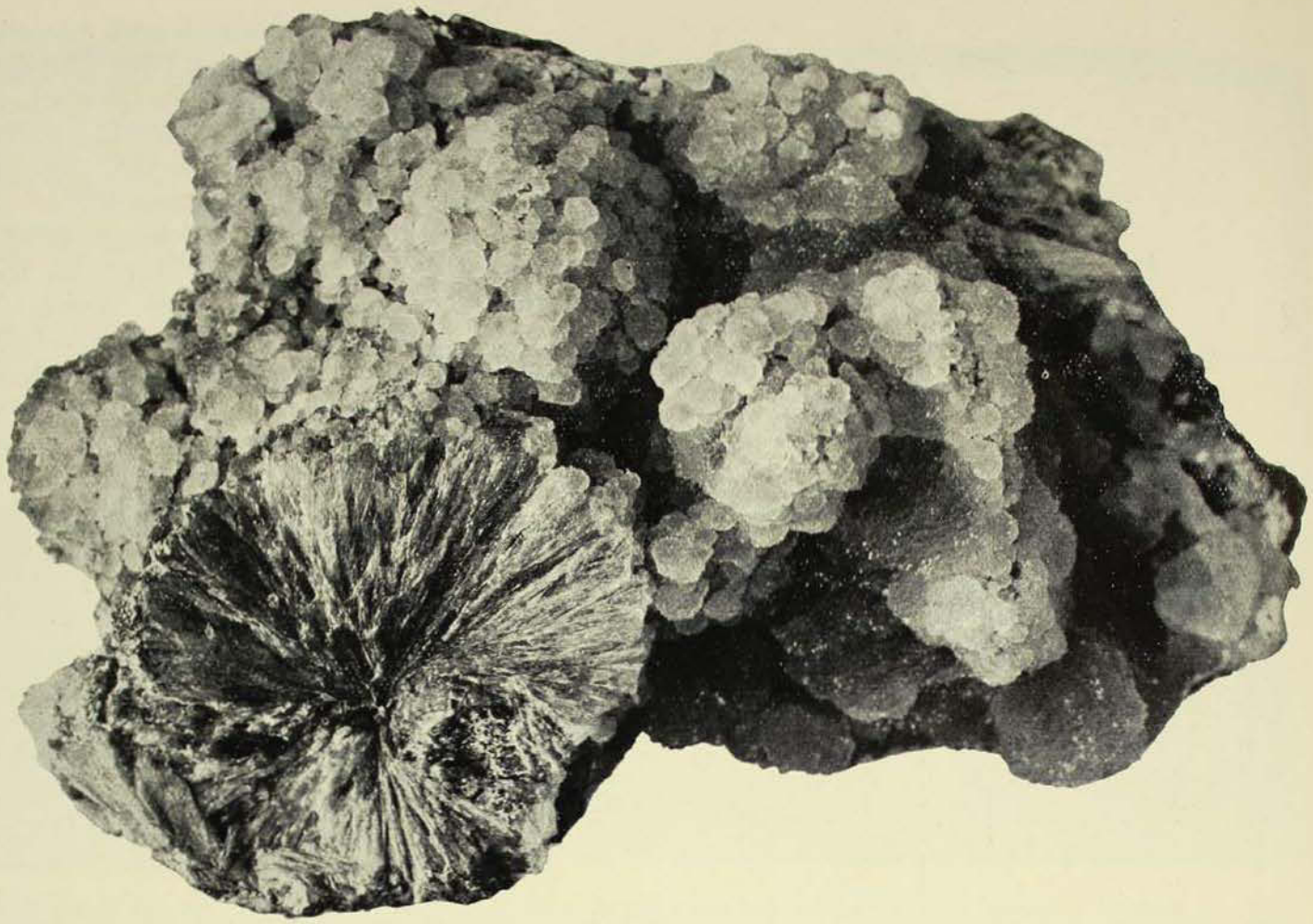
These observations were embodied in a letter to the President of the Legislative Council from Stutchbury's camp at Therabri, near Boggabri which today is a railway station on the North-West line. The letter was headed April 1, 1853, but the date did not impair the accuracy of his account, as several subsequent observers can well testify. As a matter of fact it took some little time to run the document to earth. It and other geological reports were scattered here and there in a large volume of Parliamentary Votes and Proceedings which also recorded various other matters brought before the members of the Legislative Council as this was just before the days of a Legislative Assembly.

In brief, however, Stutchbury in travelling out from Tambar Springs which lies 36 miles south-west of Gunnedah, observed, to use his own words, "on the south-west side of Yaringariwundi trappean rocks containing foliated stilbites from white through all stages of flesh colour to red . . . About one mile from the station immediately underlying the soil is a layer or vein of flesh coloured stilbite foliated and crystallized, the crystals ranging from one to two and a half inches in length." Also at Bald Hill some 40 miles north of Tambar Springs he records the associated minerals but not stilbite itself. This Yaringariwundi, although I cannot find the name on any map, from other evidence almost certainly was situated near Mt. Nombi, which lies about nine miles north-west of Tambar Springs.

Stutchbury collected this material, and according to an old list of his collections some of them may at the present day be in the Museum, although there is insufficient evidence to enable me to identify them.

A few crystals evidently found their way overseas, for there is a short note in the English *Mineralogical Magazine* of 1880 by Professor Matthew Heddle, of the University of St. Andrews. Herein he describes a crystal of stilbite from the locality of "Farrugaric-Wuardi", near Mt. Nombi, Wellington Plains, Australia. This first word is either Professor Heddle's Gaelic translation of Yaringariwundi, or else is due to the illegible writing of Mr. Stutchbury.

Some five years after this note appeared the late Mr. D. A. Porter of Tamworth, a well-known mineral collector, was at Tambar Springs and saw a few specimens



This fine specimen of radiating stilbite, associated with globular quartz having a frosted appearance, measures ten inches by six inches. It was discovered some time ago while sinking a well, and was presented to the Museum by Mrs. H. Kelly, then owner of Garrawilla Station.

[Photo.—*G. C. Clutton.*

from Mt. Nombi. He decided to explore the surrounding parts and in the neighbourhood of Garrawilla Station, seven miles north-west of Mt. Nombi, he found stilbite and associated minerals. He also traced the stilbite occurrence to near Boggabri, probably in the vicinity of Bald Hill mentioned by Stutchbury.

In 1920 Mr. Porter, accompanied by Dr. Anderson, now Director of the Museum, revisited Garrawilla Station and collected more material. This last expedition was able to spend only about a week in the field, so in May of 1933 the writer of this article, accompanied by Mr. T. L. Lougher, of Sydney, proceeded to Gunnedah and thence to Garrawilla Station, where a month was spent in collecting some 400 specimens, mainly stilbite.

OCCURRENCE OF STILBITE.

Stilbite is a hydrous silicate of aluminium, calcium, and sodium, and belongs to the zeolite family which usually occurs in basalts or related rocks. Here stilbite, associated with other zeolites and with quartz and calcite, occurs in the vesicles or cavities in a much decomposed basalt which is the lower of two extensive flows occurring in the district. Stutchbury and Dr. Anderson noted that there were two flows as did Mr. Kenny of the Geological Survey, to whom I am indebted for permission to read his report, as yet unpublished. He has recently been engaged in an extensive survey of the water resources of these districts. This stilbite-bearing basalt being so porous and, together with the upper flow, being sandwiched in between two sets of relatively impermeable sediments, is a good source of water, as the many bores put down have shown. Here again is a point of interest about Garrawilla, for both these series of sediments, according to Mr. Kenny, are Mesozoic in age, so that the two basalt flows must have been poured out in Mesozoic times, that is,

Crystals of stilbite on quartz. This reproduction is almost natural size, the complete crystal in the centre being two and a quarter inches long.
[Photo.—*G. C. Clutton.*

they are roughly of the same age as the sandstones and shales of the Sydney district. Hitherto all our big basalt flows, such as those in the Glen Innes district or on the Merriwa tableland, have been considered to be Tertiary in age which is much later than Mesozoic. In fact, up to the present there is supposed to have been no vulcanicity or any other igneous activity whatever in Mesozoic times in New South Wales.

Compared with the stilbite-bearing basalt, the upper basalt flow presents a great difference in appearance, being hard and compact. The lower flow may have been weathered extremely before the extrusion of the upper one, and may now be undergoing a second weathering in the numerous places where it is exposed. On the other hand it may owe its decomposed appearance to the fact that in the later stages of consolidation it was attacked by solutions from the basalt reservoir below, these solutions really being the source of the zeolites which have crystallized out in steam holes and other crevices in the basalt.

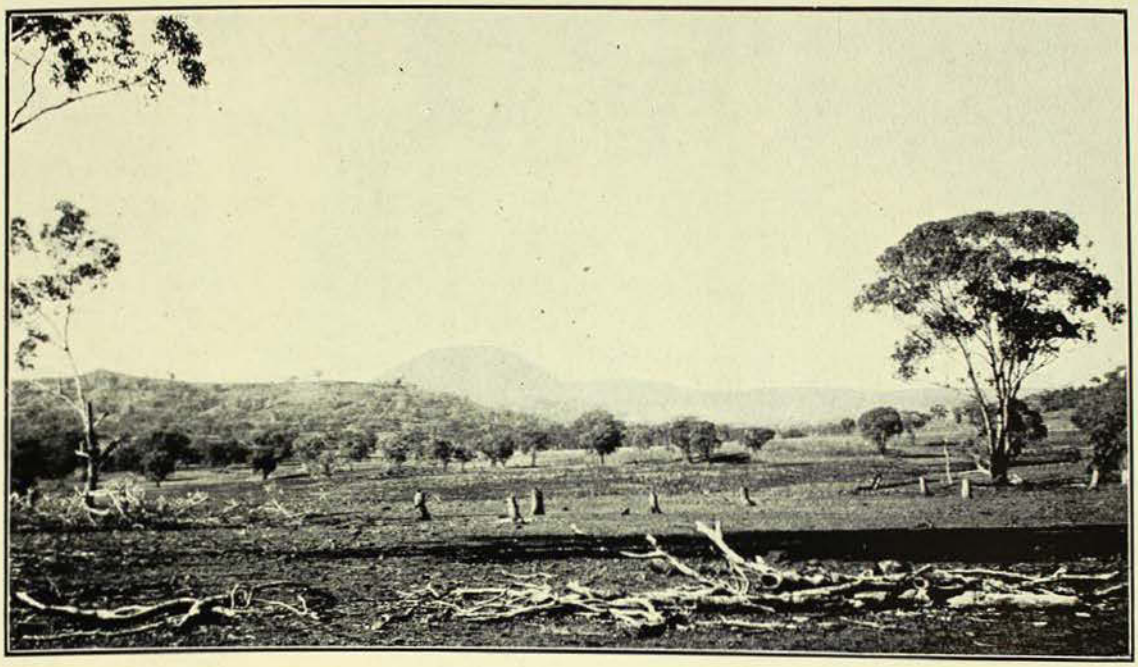
These two basalt flows of the Garrawilla series, which attain a maximum thickness of 600 feet, outcrop over an area of about 500-600 square miles, the east-west boundary line being Tambar Springs and Coonabarabran, which lies 68 miles west of Gunnedah, and the north-south boundary being Garrawilla and Bomera. There are scattered extensions of the flows near Gunnedah and for a considerable distance to the north of Garrawilla, so that it is possible that the flows once extended for over 1,000 square miles.

TOPOGRAPHY.

The Garrawilla-Tambar Springs portion of the above area is roughly triangular in shape, bounded on the north-west and south-west by two low ranges of Mesozoic sediments both offshoots of the Warrumbungle Mountains. On the east the boundary is Cox's Creek which eventually joins the Namoi River at Boggabri.

Girrawillie Creek is a tributary of Cox's Creek, and in the lower part of its course has deposited extensive black soil flood plains. Also to the east of Cox's Creek lie more flood plains, so that in these parts no basalts are to be seen on the surface. The topography therefore is of a fairly mature type broken only by low hills and ridges of basalt. Relief is also afforded by the presence of several conical peaks of phonolite and trachyte, such as "running water". In times of drought, however, the name is no longer apt. By kind permission of Mr. Anderson we were permitted to occupy the shearers' quarters which were quite comfortable and in addition afforded a haven pre-eminently suitable for our mud-stained clothes and work-worn frames after a hard day's work with pick and shovel.

It is necessary here to make acknowledgement of the courtesy and hospitality of Mr. R. Clifton, the owner of the adjoining station, who also permitted us to collect freely on his property.



Mount Bulga, one of those Tertiary alkaline intrusions, the precipitous sides of which make it a conspicuous landmark.

[Photo.—*R. O. Chalmers.*

Mounts Bulga, Nombi, Talbareya, and Kiadmoot. These are alkaline rocks of Tertiary age and have perhaps intruded themselves in a very viscous state, through the country rock, in the manner of similar occurrences in the Lansdowne district near Taree.[1] Some of these stand as isolated conical hills in the middle of the flat black-soil plains and present a peculiar, not to say unnatural, appearance. An example is afforded by Mount Mullaly.

THE COLLECTORS AT WORK.

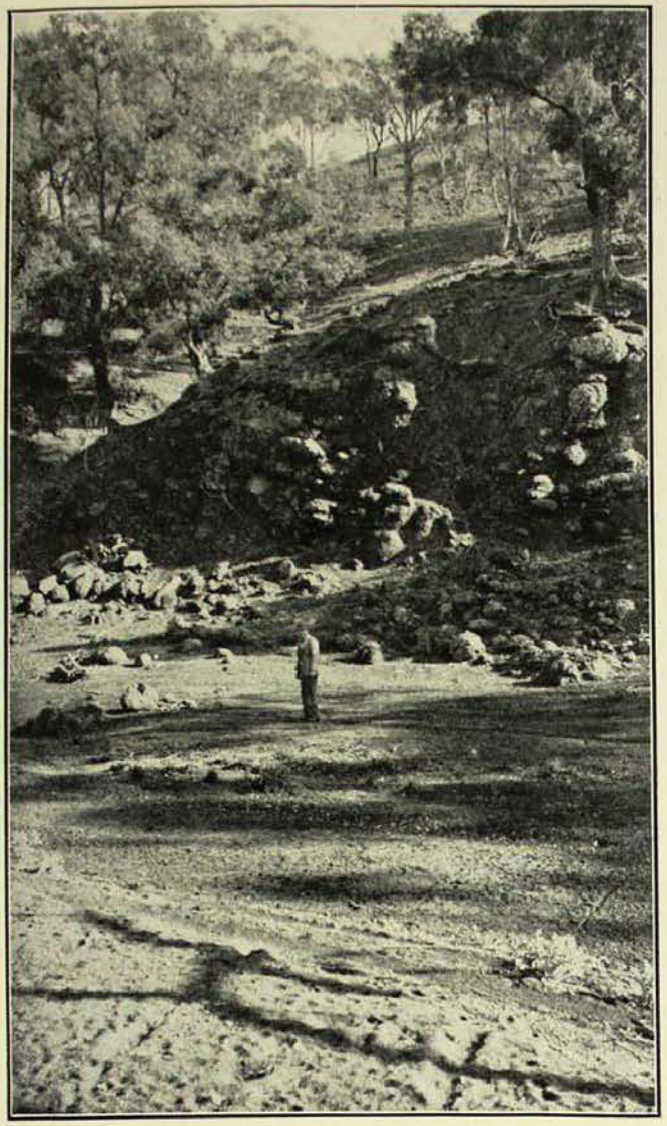
Garrawilla Station, one of the oldest holdings in the district, and formerly of greater extent, is situated most pleasantly on Girrawillie Creek and just about where the extensive flood plains commence. It is the property of Mr. C. A. Anderson. The name Garrawilla is a corruption of Girrawillie which is supposed to mean

Most of the collecting was done in the vicinity of Girrawillie Creek, where the occurrence of stilbite and associated minerals is much the same as was described by Stutchbury from Mt. Nombi eighty-one years ago.

In one place, "Rocky Point", or "The Bluff", the basalt, although more solid than in other places, had commenced to weather in typically spheroidal fashion, and in places the stilbite veins had afforded ready access to the agents of atmospheric weathering so that curved layers of well crystallized stilbite were to be found actually in between spherical basalt boulders, which made it fairly easy to collect.

Again the stilbite, in this particular place usually associated with quartz,

[1] AUSTRALIAN MUSEUM MAGAZINE, V, No. 5, 1934, p. 176.



Rocky Point, or the Bluff as it was called by Dr. C. Anderson. The spheroidal weathering of the basalt can be clearly seen, and it was here that the largest stilbite crystals were obtained.
[Photo.—*R. O. Chalmers.*

calcite, or both, was found in a small bank of the creek only about thirty feet high, forming a complicated network of veins which imparted a fragmental appearance to the basalt. Such is the abundance of stilbite in these parts that innumerable small crystal groups are found in the soil, and can be seen glistening in the sunlight.

One of the great difficulties on this field is to obtain absolutely fresh and unweathered specimens. Most other famous zeolite localities in New South Wales, such as Kyogle, Ben Lomond, and Ardglen, are in shire or railway quarries where machinery has enabled one to work amongst the fresh rock. Here at Garrawilla however, it is private property, sheep country, where no quarries or cuttings of any great size exist and an abundant supply of ground water has ample opportunity to wreak havoc amongst the specimens. Nevertheless some fine material of good red colour was obtained, and, especially from "The Bluff", many crystals of a lustrous fawn colour attained dimensions of two and a half by one inches. This was in some measure due to the generosity of Mr. Anderson who placed at our disposal the services of an erstwhile miner, Tom Kennedy, who at the time was engaged in well-sinking in the district. Tom carried out several blasting operations for us and amused us by his droll, yet very sound philosophies and reflections, as well as amazed us by the minimum of effort that he imparted to his wielding of pick and crowbar to obtain the maximum result.

COMMERCIAL USE OF ZEOLITES.

The following is in no way intended as a prediction that one day stilbite will be even a moderately valuable mineral, but it is of interest to point out that crushed zeolite can be, and is used as a water softener on a commercial scale.

Great beds of it are made up, and as the hard water which owes its hardness to the presence of calcium, passes through the bed, the sodium of the zeolite replaces the calcium in the water and softens it. The beauty of this process is that when the zeolite is spent the bed is allowed to soak in a brine solution for some months, the zeolite taking back its sodium and losing the calcium.

One disadvantage of using natural zeolite is that synthetic zeolite which can be manufactured commercially, functions twice as well in some cases, and a further disadvantage in the case of stilbite is that it is not a pure sodium zeolite.

The main reason, however, for mentioning the commercial aspect, is the very large area of the stilbite-bearing basalt, quantity always being an important factor in most processes. Stutchbury and Porter made it their business to trace its extent, the latter giving an estimate of 150 square miles for the area of the actual exposure of the stilbite-bearing basalts, and I am certain that this should be regarded as no exaggeration.

Fighting and Strategy

HOW BIRDS DEFEND THEIR HOMES.

By A. H. CHISHOLM.

IF some casual observer of Australian birds were to say to me, "I'll tell you which is the pluckiest of all among the little fellows", I would know at once, without parley, that a tribute was to be paid to the Wagtail. For this small black and white Flycatcher, one of the commonest birds in Australia, is certainly the most resolute of fighters during the breeding season. He—and she, too—will assail almost any creature, from a lizard to an eagle, from a cat to a man.

Most other Flycatchers rely on simpler methods in defence of their nests. The Grey Fantail, for example, is apt to suffer itself to be handled rather than forsake its tiny home and young. The Black-faced Flycatcher, too, sometimes clings to its mossy nest with blind determination, so that you have to lift the bird off if you wish to see the eggs. Is it not curious, therefore, that the Wagtail, which is more closely associated with man than any of its relatives, should rely wholly on offensive tactics?

It is all, no doubt, a matter of temperament, and I have often thought that the high-spirited nature of the Wagtail is in some way connected with its plumage colours. There would be no special basis for this suggestion, perhaps, if "Willy Wag" were an isolated example of a black and white fighter, but you have to consider that black and white birds generally are prominent features of the Australian landscape, and that all have temperaments in accord. They are all enterprising, all aggressive, and all have much to say for themselves.

What birds are more abundant throughout various parts of the Continent than the Magpies, the Black-throated Butcher-bird, the Magpie-Lark, and the Wagtail, all of which are handsomely garbed in black and white, of varying schemes, in both sexes? They not only add life and charm to grassy spaces, but some are abundant in or about cities. The White-backed Magpie is the commonest bird on the fringes of Melbourne. The Magpie-Lark (Peewee) and Wagtail occur abundantly in several capital cities, and are so numerous in the metropolis of Queensland that we are wont to speak of Brisbane as "The City of Black and White". Oddly enough, the only one of these birds that extends to Tasmania is a single species of Magpie. Apparently the island State was cut off from the mainland before most of the black and white birds were "born".

What is the reason for this abundance of birds of a particular colour scheme? I suggest here, as I have suggested previously,[1] that they are protected by their very prominence. Camouflage has no part in their plumage, and reticence no part in their conduct. Most Australians have heard the glorious carols of Magpies. Most Queenslanders have enjoyed the wonderful organ-like songs of the Black-throated Butcher-Bird. And almost every child in the Continent knows the piping of the Magpie-Lark and the chatter of the Wagtail—the chatter that caused aborigines to say, "Little bird bin talkem", and to guard against "Willy" as a tale-bearer. Is it not fitting that such birds—birds of bold plumage and bold voices—should have bold dispositions?

The Wagtail, as I have said, will attack creatures a hundred times its size, despite the fact that its weapons are negligible. The Magpie-Lark, too, apparently believing valour to be the better part of discretion, frequently assails boys, cats, and kindred nuisances; I have seen one of these birds chasing and buffeting a huge eagle.

[1] CHISHOLM.—*Nature Fantasy in Australia*, 1932.

and there is a case on record of a nest-robbing boy being seriously injured by a " Peewee ". Indeed, the Wagtail and the Magpie-Lark frequently are associated in the breeding season and join forces for the purpose of repulsing an intruder.

In perhaps seven out of ten cases, if you see the mud nest of a " Peewee " high in a tree you may be sure of finding the small fibrous cup of the Wagtail on a lower branch of the same tree, or in a tree near at hand. This association on the part of black and white birds is too frequent to be dismissed as a coincidence. Possibly each appreciates the strong fighting spirit of the other, but I incline to think that in most, if not all, cases the larger bird is first in possession, and thus the Wagtail is the " guest ".

A similar association occurs between two birds—both of which are black—in North Queensland. There the Manucode, or Trumpet-bird, a relative of the Birds of Paradise, makes a practice of placing its nest near that of the truculent Black Butcher-bird—it waits until the Butcher-bird begins to build, and then secures a site in a tree nearby. In this case, apparently, the alliance is entirely one-sided.

Tawny Frogmouth in angry mood.
[Photo.—*A. H. Chisholm.*

Equally as aggressive as the Wagtail and " Peewee ", and more formidable because of their strong beaks, the Magpies and Butcher-birds may be dangerous in the nesting season. " Maggie ", however, is selective in his attitude to humanity—he usually confines his attacks to boys. It really does seem that experience has taught some of these birds to beware of boys, and that they shape their conduct accordingly. As a lad in the country I used to be very aggrieved because a pair of Magpies frequently attacked me and never molested my father. Moreover, it is a common bush belief that " Maggies " rarely if ever attack girls, but have long memories in respect of boys. In one place a pair of Magpies is said to have singled out two boys and assaulted them, and them only, at intervals during four years.

Another eloquent instance on the point, and a very amusing one, occurred on a golf links near Melbourne in the spring of 1933. A pair of Magpies nesting at that place developed a strong distaste for the caddy boys, but never offered to attack men. They made only one exception, and that, apparently, through a misapprehension. The exception was a man about five feet in height. His smallness, combined with his plus-fours, caused the birds to bracket him with the caddies and, greatly to his wrath and greatly to the delight of men who were not molested, they flew down and assailed him every time he appeared on the links.

In addition to the birds I have mentioned there are (aside from birds that are black

with white marks on wings or tails) some few other Australian species garbed in black and white, but this colour scheme obtains only with the male birds in nearly all of these cases. This difference in sex colours may carry some significance, since such birds are neither so familiar nor so aggressive as, say, the Wagtail. Perhaps the best known species among them is the slim and graceful bird known variously as the White-shouldered Caterpillar-eater, Triller, Midget-Magpie, Maggie Dower, and Peewee-Lark. He, too, is as bold in voice and conduct as he is in plumage, but his quieter-coloured mate lacks the fighting disposition of the black and white birds.

If anything further is needed to emphasize the affinity between pied plumage and an aggressive temperament it is given by negative evidence—the fact that few birds of other plumage colours are so truculent in defence of the home. Various birds of prey, of course, being bandits by nature, are apt to become dangerous if their nests are molested, and so are the big flightless birds, the Emu and Cassowary, each of which can kick with tremendous force. But the only small birds worthy to be ranked with the Wagtail in assertiveness are, perhaps, one or two of the Kingfishers, the slim, black, fish-tailed bird known as the Drongo, and the familiar Noisy Miner.

Possibly the Drongo (which is called in North Queensland "the black detective") and the Miner (which is usually known as the Soldier-bird) should be regarded as sentries rather than actual fighters, for their shouting and shrieking on suspicion of danger arouse every bird in the forests. It is the hullabaloo created by Soldier-birds at the appearance of a snake that causes them to be esteemed by country dwellers. It is the same alarmist tendency that causes them to be detested by shooters in search of game. Sir A. Conan Doyle, in his book on Australia, applauded this bush sentry. "Good little Noisy Miner", he wrote. "All my sympathies are with you. I would do the same if I could."

Blue Wren in agitated mood.
[Photo.—*R. T. Littlejohns.*

So much for the birds which rely on offence as a means of defence. Most other species, if they make anything more than vocal attempts to defend their homes, rely on strategy rather than aggressiveness.

* * * *

Strategic tactics among nesting birds take many quaint forms. The weird-

looking Frogmouth (sometimes called "Mopoke") relies on his grotesque appearance—he causes his feathers to stick out, lowers the wings, opens the huge beak so that the yellow interior of the mouth is shown, and contrives generally to look so forbidding that even the boldest animal is apt to become alarmed. The Yellow Robin, on the other hand, sometimes crouches and sinks into the nest, so that only the tips of beak and tail may be seen. Blue Wrens press their bodies to the ground and scamper along like mice. Dotterels, at a call, cause their babies to run rapidly, and, at another call, cause them to squat lifelessly on the sand.

Curlews on the offensive. [Photo.—*Dr. W. MacGillivray.*

But undoubtedly the favourite "stunt", and perhaps the most interesting one, adopted by many small birds in defence of their nests is the feigning of injury.

It has been stated in America that only ground-dwelling birds there adopt this device. Even if that be a correct report, it does not hold good in Australia. Here, the practice of feigning to be injured is followed not only by many birds which nest on the ground, but by numbers of others which have their homes in shrubs and the lower parts of trees.

The Yellow-tufted Honey-eater is a brilliant exponent of the art. Disturb one of these pretty birds from her pendulous cradle in a small tree, and she will fly from the nest to the ground, sprawl with feathers outspread and wings trembling, and then go fluttering and tumbling along in a most appealing fashion. If you wish to oblige the little actor you will follow her for perhaps thirty or forty yards, upon which she will suddenly recover from her "injuries", and with a complacent flick of the tail, will flit to the nearest tree.

White-fronted Chats are no less accomplished. So strong is the impulse of these birds to feign injury that, when a nest is discovered, the two owners are frequently reinforced by neighbouring Chats, and all take part in the tumbling and scrambling tactics in their efforts to lead the intruder away.

Watching such exhibitions, among various kinds of birds, from time to time during many years, I have marvelled at the cleverness of the actors and at the extraordinary poses and antics they achieve. Sometimes the bird almost stands on its head in the course of its rolling and tumbling. Sometimes it raises one wing and beats the ground with the other. Sometimes it lies flat on the ground, with wings and tails outspread. Especially are the tail feathers expanded by Quail-Thrushes, Pratincoles, and some of the Dotterels, all of which have tails tipped with white. Similarly, the Chestnut-breasted Shelduck displays a white wing patch to reinforce the lure of its tumbling. Sometimes, as in the cases of certain Whistlers and Robins, there is no falling and scrambling, but a fluffing of the body feathers and a trembling and raising of the wings as the bird hops stiffly over the ground.

Young Curlews (Stone-plovers) in hiding.

[Photo.—*H. Burrell.*

One of the largest of these feathered actors, the Stone Curlew, tries various devices when its eggs are discovered. The first efforts to distract the intruder's attention usually consist of jerking the head and raising and spreading the tail so as to display the conspicuous white under-surface. Should this manoeuvre not be effective the birds feign disablement—they trail the wings, sink to the ground, shuffle along with the fore part of the body on the earth, and meanwhile utter piteous cries, as though in pain.

In a particular case in which these tactics failed, the Curlews' behaviour underwent an almost startling change. Running to within four yards of the intruder they menaced him with wings extended and tail elevated and spread fanwise. Their attitude now was formidable, and it was emphasized by notes that were not appealing, but obviously threatening.

Such a case as this—one in which the birds indicated definite control of their actions by changing them at will—is opposed to the belief that, in cases of the kind, birds are actually incapacitated.

"It is not correct to speak of such procedures as feigning injury", says one English writer. "The bird is deliriously excited and has a fit." Supporting this view, W. H. Hudson, a famous British naturalist, says that when a nesting bird flutters to the ground it does so from pain, and is for the moment incapable of flight. "Its efforts to recover flight and safety", he adds, "cause it to beat its wings, and tremble, and gasp with open mouth".

I disagree with this theory of the English writers, and I suspect that they themselves would disagree with it if they had seen as much of the "broken-wing" trick as we in Australia have. There need be no doubt that the bird is excited, but to describe its actions as "a fit" is absurd. If it were incapable of flight it would flutter about in the one spot. As matters are, it watches the intruder carefully while fluttering away from the nest, and if he does not follow it will fly back towards

him and repeat the performance. It has no need to make "efforts" to recover flight; for it can do so at any moment.

Anyone who thinks that, in such circumstances, a bird is really unable to fly, should try to catch one of the little actors—and watch it flit into a safe place as soon as it has lured him from the nest. It was always an amusing interlude, in my bush days, to see a dog tricked in this way. Every raw dog shared the Hudsonian view that the fluttering bird was "incapable of flight", and his disgusted expression when the performer flew lightly into a tree was highly diverting.

I do not think it probable that this trickery was devised for the confusion of man, even though it is practised largely upon him. It may have been born of encounters with reptiles or small mammals. In any case, whatever was the originating cause of the tactics (and they may have had their origin in actual semi-paralysis), it is quite certain, in my view, that the birds appreciate what they are doing, and that they are, in fact, consciously trying to lead intruders from the nests. The actions are just as resolute as those of birds which attempt to defend their homes by force, and just as intelligent as those of birds which, in times of supposed danger, carry their babies away on their backs, beneath their wings, or in their feet.

The Bamboo in Australia

By WALTER S. CAMPBELL.

[NOTE: The author, formerly Director of Agriculture in New South Wales, is now ninety years of age and has a clear recollection of events which took place, and of conditions in Sydney which had passed away before most of us were born. As Mr. Campbell is now travelling abroad, this article has not been read in proof by him.—EDITOR.]

THE first discovery of bamboo growing in Australia was made, I believe, by W. Carron, botanist to Kennedy's ill-fated expedition, which in 1848 set out from Rockingham Bay, North Queensland, to explore the country northwards to Cape York. Carron was one of the two survivors of the expedition, and when he returned to Sydney he received an appointment in the Department of Customs, being later transferred to the Botanical Gardens as overseer. There I became acquainted with him and heard the story of his terrible hardships and of his discovery of the bamboo.

Mr. C. T. White, Government Botanist of Queensland, informs me that this bamboo is very common on the foothills of the Bellenden Ker Range; it is a rain-forest or "scrub" climber, not an upright-growing species, and has been named *Bambusa Morcheadiana*. There is another species, *Arundinaria Goboni*, known only from the Starcke River in the southern part of Cape York Peninsula. In both cases the flowers are unknown, and therefore the scientific names are provisional only.

In the account of his remarkable journey across Australia, John McDouall Stuart relates: "Saturday, 12 July, 1866; the Mary Adelaide River. One new feature seen today is the growing of large clumps of bamboo, from fifty to sixty feet in height and about six inches in diameter at the butt." In the year 1911, when I was examining the northern portion of the Northern Territory for the Federal Government, I happened to come across McDouall Stuart's track along the Adelaide River, and there I met with the identical clumps of bamboo to which he referred. About the straggling stumps of some of these were hundreds of beautiful little finches, darting about most merrily.

As I travelled along the lower Daly River, some distance from the Adelaide, I encountered some extensive groups of a beautiful and graceful species, which differed considerably from those on the

Adelaide, being slenderer and having smoother and less prominent nodes. The aboriginal name of the bamboo in the Daly River district is *moolee*. I camped under one of these clumps for two nights, in company with a settler, one of two who were experimenting in the cultivation of crops on a small area of land on the opposite side of the river. He informed me that this bamboo belonged to an aboriginal chief, and that a few years prior to my visit the bamboos had flowered and seeded, an event believed to occur at intervals of about thirty years, after which the bamboos die. The seeds were produced in great abundance, and various birds and animals, especially wild ducks and geese, that fed upon them became so fat that they could hardly walk. The rare flowering of the bamboo explains why Australian botanists have not been able to determine the species; no bamboo in the Northern Territory has been systematically determined up to the present. At Port Essington I found a small clump of a large species growing within the old military settlement abandoned in 1849; this was probably introduced, with other plants, from the East at the time when the settlement was formed.

USES OF THE BAMBOO.

The aborigines of the Northern Territory use the straightest stems of the bamboo as spear shafts, which are about eight to ten feet in length, with carefully fashioned points of quartzite; these spears are thrown by means of broad wooden womerahs. Another kind of spear is made of slender bamboo branches; these are about two feet six inches in length and less than half an inch in diameter, and in the thicker end is inserted a slender tea-tree stem (*Leptospermum*), sharpened at the end to form the spear point. These spears are thrown with the aid of womerahs which are about the same length as the spears but a little thicker. Kangaroos and other animals are killed by means of these arrow-like spears, which are thrown with great force and accuracy.

In other parts of the Northern Territory, and particularly on Melville Island, the spears in general use are made of "iron wood" (*Erythrophlœum Laboucherii*); they are cut out of large solid pieces of timber, and have very large barbs. At the present time they are made exactly as they were over a hundred years ago, when the first white settlers arrived. A species of bamboo grows on Melville Island, but I could not ascertain whether or not it is used to make spears.

At Darwin I found that strips of bamboo, six or eight feet in length and about an inch and a half in width, are used to some extent for shading verandahs, a purpose for which they are admirably adapted. For bush houses they would be much better than the perishable laths generally used.

BAMBOO IN SYDNEY.

The bamboo must have been introduced into New South Wales in the very early days of settlement, when there was considerable trade with India and the East. I remember two very old clumps which were growing in the Botanical Gardens, Sydney, eighty years ago; one is still in existence, the other was destroyed some years since. When I first became acquainted with them they were within about fifteen feet of the salt water at high tide; there was a dwarf stone wall to keep the sea water from the gardens, and at low tide a sandy beach extended out for some distance, the home of armies of large blue-backed crabs, marching about in great order. All this portion of Farm Cove was reclaimed many years ago under the direction of Charles Moore, formerly Curator of the Botanical Gardens.

Many species of bamboo have from time to time been introduced into Australia, chiefly for ornamental purposes. In 1854 a show of exhibits from New South Wales for the Paris International Exhibition of 1855 was opened in the "large hall" of the Australian Museum. Among the exhibits were some fine slender stems of the black bamboo (*Bambusa nigra*), shown by James Macarthur of Camden Park. I heard him describing his numerous exhibits, and can remember that he strongly recommended the use of the black bamboo for the making of fishing rods.