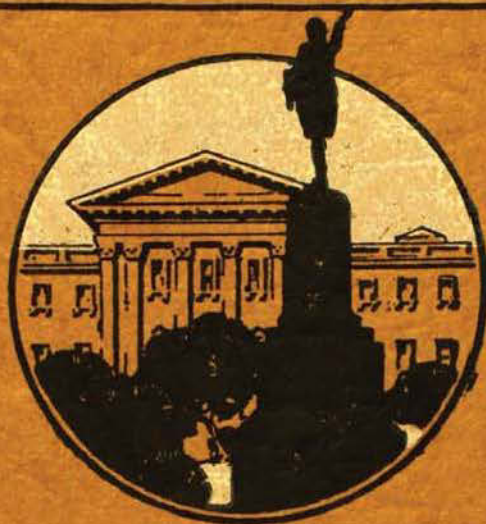


The AUSTRALIAN MUSEUM MAGAZINE

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



The William Hatfield Yates Collection of Minerals.

A-Trouting We Will Go - *C. Anderson, M.A., D.Sc.*

Mineral Collecting in Central Australia - - - - -

T. Hodge-Smith.

Diatoms - - - - - *H. Fordham.*

Asbestos: Its Occurrence and Uses - *O. Chalmers.*

Rock and Goose Barnacles - - - - - *W. Boardman.*

Wild Life on Inland Waters - - - - -

Charles Barrett, C.M.Z.S.

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The AUSTRALIAN MUSEUM

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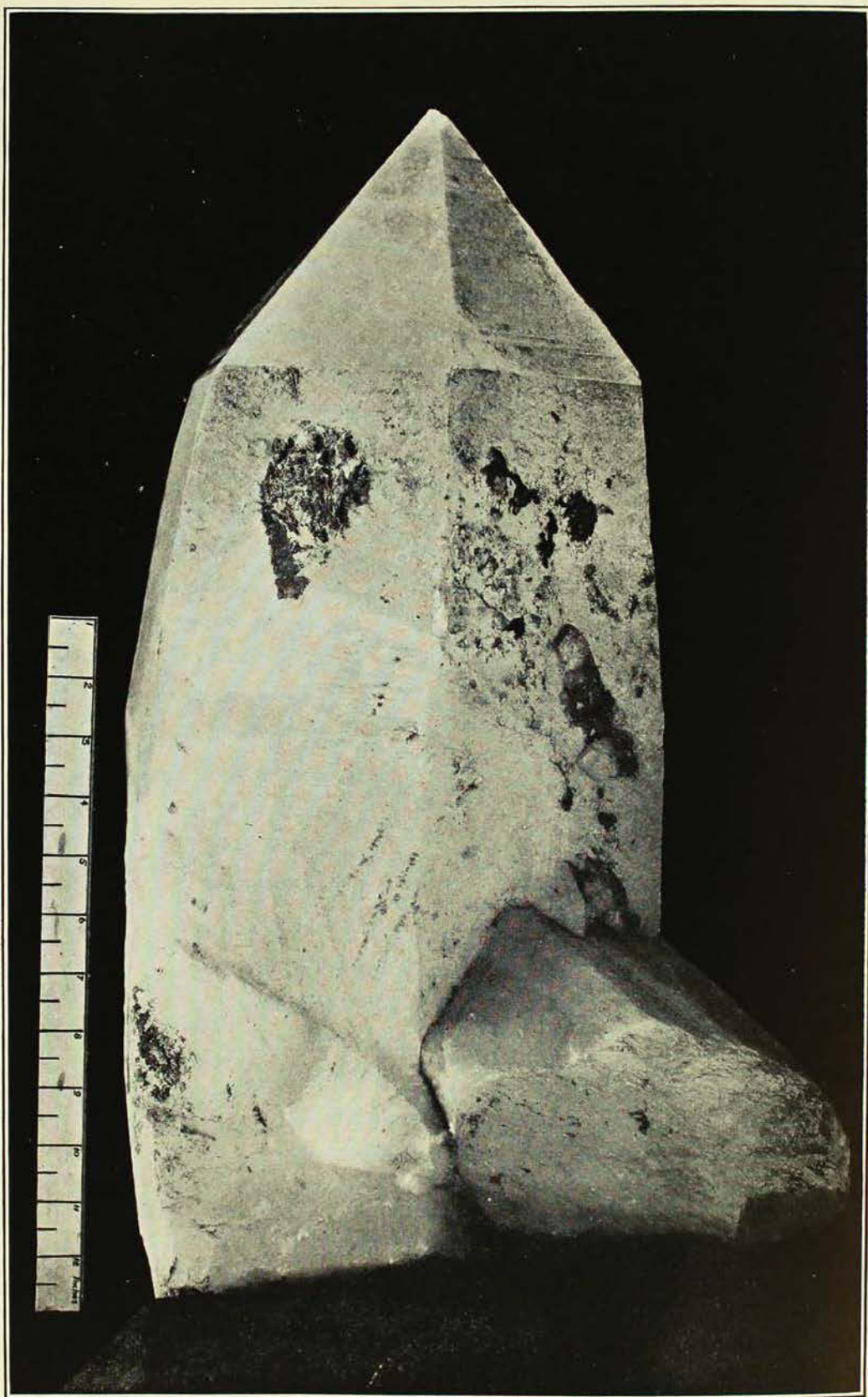
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A magnificent quartz crystal from the William Hatfield Yates collection. It stands $24\frac{1}{2}$ inches high and is $31\frac{1}{2}$ inches in circumference. Locality, Kingsgate, near Glen Innes, New South Wales.

[Photo.—G. C. Clutton.]



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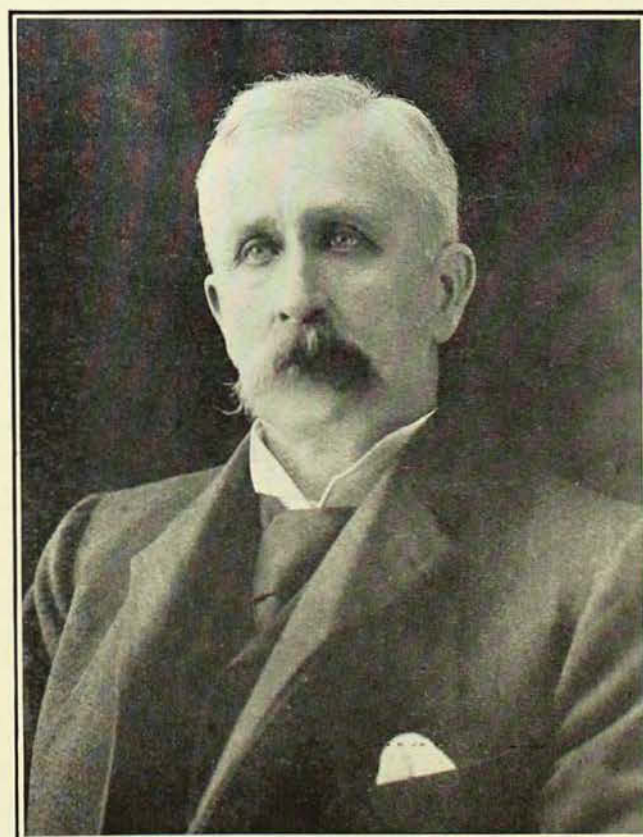
APRIL-JUNE, 1931.

The William Hatfield Yates Collection of Minerals

THIS large and valuable collection of minerals has been presented to the Trustees of the Museum by the family of the late William Hatfield Yates.

Born in 1843 at Manchester, England, Mr. Yates arrived in Australia as a young man in 1864, accompanied by his brother Charles. Together they immediately turned their attention to mining and were among the pioneer prospectors of Gippsland, Victoria. Coming to New South Wales, they prospected in many parts of the then colony under exceedingly trying conditions in places where not even coach routes had been established. Among the many exciting experiences was the sheltering for one night in their camp of the famous bushranger, Ned Kelly.

They returned to England, but Mr. Yates remained there only for three years, coming back to carry on his work and to represent the well-known firm of Johnston and Matthey, Hatton Garden, London. Mr. Yates was an authority on the rare metals.



The late William H. Yates.

In 1886 he married Eleanor Bourke at Armidale, New South Wales. It was in the New England district that his most successful mining ventures were undertaken, although he was associated with the opening up of Kalgoorlie in Western Australia, with the famous Mount Morgan of Queensland, and was one of the first to find opals at White Cliffs, New South Wales.

His name will, perhaps, be best remembered in association with Kingsgate, near Glen Innes, New South Wales. Originally he was associated with Messrs. Marks and Vickery as partners in bismuth and molybdenite mining. Later he became sole owner, and eventually sold out to the Broken Hill Proprietary Limited in 1918. The Kingsgate mines have produced some of the finest specimens of molybdenite yet found anywhere in the world. Mr. Yates obtained the gold medal at the Franco-British Exhibition, 1908, for his exhibit of this mineral, and these same specimens are included in the collection. It is highly improbable that finer exhibits are to be found in any museum today. Kingsgate, in addition to being famous for its molybdenite, has produced exceptionally large slugs of native bismuth, usually deposited in the spaces between quartz crystals. Among

the very interesting slugs in this collection is one weighing ten pounds.

Another interesting and perhaps unique specimen is that of calcite pseudomorphous after molybdenite. The original form of the molybdenite "leaves" is perfectly preserved in calcite. There is included a very interesting assortment of quartz crystals, many doubly terminated, and several with trapezohedral forms. One of these, the largest quartz crystal I have ever seen, forms the subject of our frontispiece.

An excellent series of enhydros from Beechworth, Victoria, a large mass of monazite from north Queensland, three crystals of stibnite from Hillgrove, New South Wales, cassiterite from many of the New England tin deposits, a large collection of wolframite from many Australian and foreign localities, and a host of other interesting specimens are included in the collection.

Mr. Yates paid special attention to the paragenesis of minerals, and his collection will add considerably to our knowledge of Australian mineralogy.

A special display of the collection will be made in the mineral gallery after the first of May.

T. H.-S.

Mr. E. C. Andrews, Trustee, has been awarded the Lyell Medal of the Geological Society of London, in recognition of his distinguished services to geological science. At the February meeting he was congratulated by the President and Members of the Board on the honour conferred upon him.

* * * *

To fill the vacancy on the Board of Trustees caused by the death of Mr. O. C. Beale, Mr. Frederick W. Marks, F.C.A. (Aust.), was elected a member at the March meeting. Mr. Marks is a chartered accountant and company

director, and a member of the Council of the Royal North Shore Hospital. He has been appointed a member of the Finance and Publicity Committee of the Board, and his expert knowledge of financial and business methods will be of the greatest service.

* * * *

After a long illness, during which he was granted leave of absence, Dr. G. H. Abbott, Trustee, has now recovered sufficiently to resume attendance at the meetings of the Board, and received a warm welcome from his colleagues.

A-Trouting We Will Go

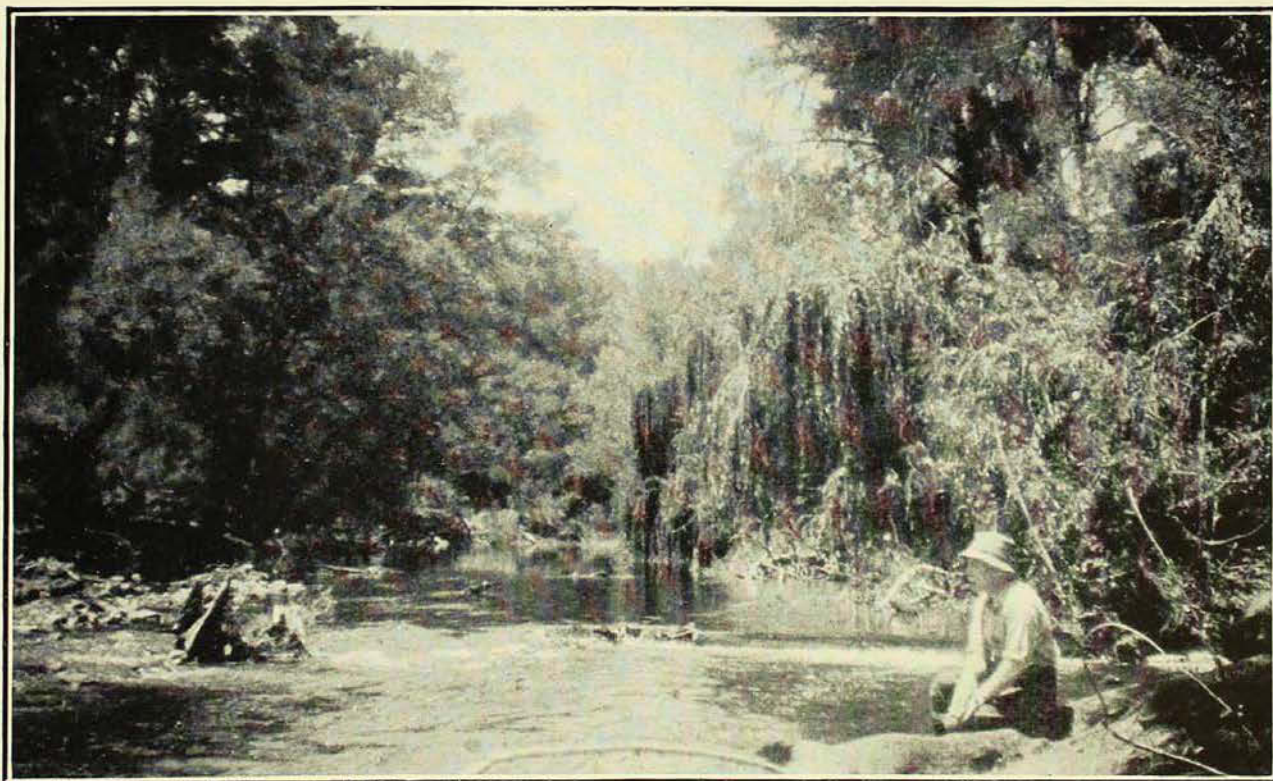
By C. ANDERSON, M.A., D.Sc.

Give me mine angle, we'll to the river.

Antony and Cleopatra.

TROUT fishing has this in common with golf, that to the uninitiated it seems mere foolish waste of time and money, but to the addict there is no avocation more deserving of serious attention. It must be admitted that the material results are often insignificant, for your trout is not one of those foolish fishes that can be caught in large numbers.

content, even though the fish escaped in the end. Personally I am not prepared to agree with the saying "'tis better to have hooked and lost than never to have hooked at all," for an inconclusive affair of that sort leaves a nasty taste in the mouths of both parties, and I confess to a preference for carrying the battle to a successful conclusion—for the angler—

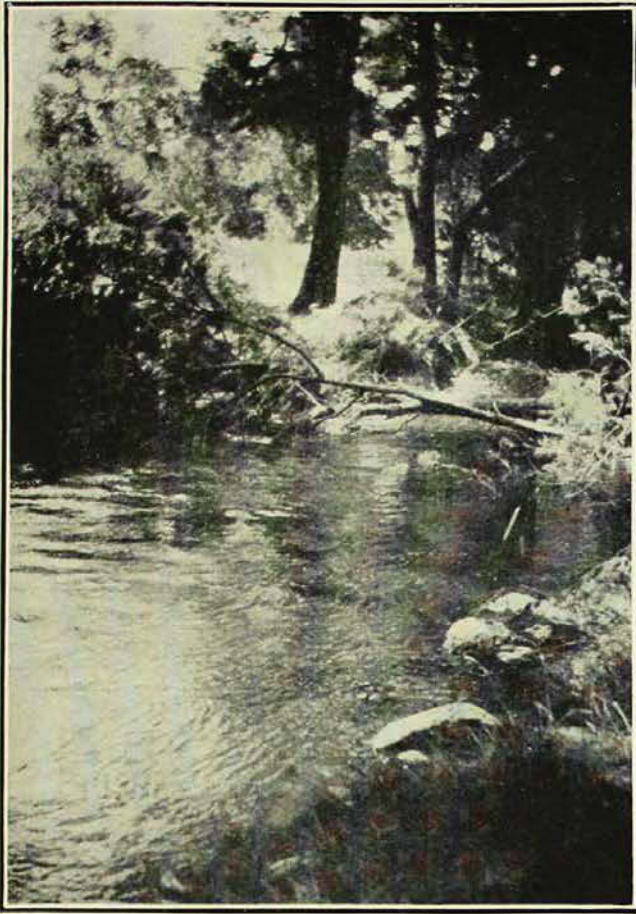


A shady spot on the Goodradigbee.

[Photo.—M. Anderson.]

But it has been said that catching fish is not all of fishing, and this is especially true of angling for trout. One who has the true spirit of the angler can enjoy himself on the river even though his basket is but poorly filled at the end of a toilsome day, and I have known an ardent fisherman to declare that, if he could but hook one fair-sized trout per day, and play it for ten minutes or so, he would be quite

and I believe, too, that it is kinder to land a fish as soon as possible after it is hooked. We have the authority of Izaak Walton and other distinguished anglers for the view that fishes have very little feeling or sensitiveness to pain, and certainly some support for this opinion can be found in the fact that a fish which has been hooked and lost will sometimes take the lure again after a few minutes. Yet one



My lucky pool; here each morning for several days
one good trout was captured.

[Photo.—C. Anderson.]

cannot help thinking that even a relatively insensitive creature must feel some discomfort with a barbed hook embedded in its jaw, and can sympathize with Byron's outburst:

And angling, too, that solitary vice,
Whatever Izaak Walton sings or says:
The quaint, old, cruel coxcomb, in his gullet
Should have a hook, and a small trout to pull it.

THE LURE OF THE RIVER.

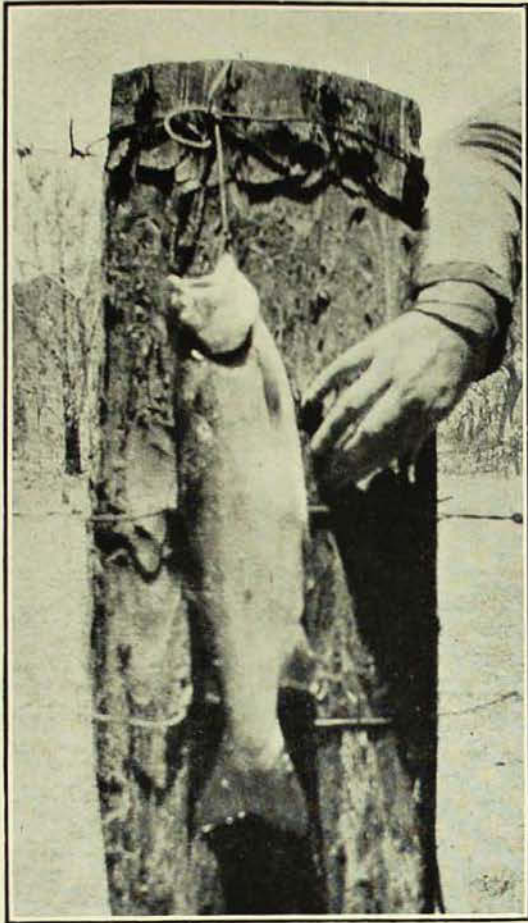
The charm of trout angling lies not merely in the satisfaction of pitting one's wits successfully against this game and wily fish, though there is more pleasure and excitement in the capture of one fighting Rainbow than in landing several stupid and sluggish Murray Cod. It is the background and the accessory delights of the sport that make it so enjoyable to one who takes pleasure in the sights and sounds of the country and river side, and is responsive to the magic and the majesty of the Australian bush. Pursuit of the trout takes one into sequestered

places amongst the hills, amid glorious scenery, where the river tumbles in cascades or prattles over pebbly reaches, with here and there a deep pool where the big fellows lurk and can sometimes be tempted to their doom. There is music in the ripple of the stream and the soft splash and "plowter" of the water as it falls into a pool, the tree-lined banks are alive with birds large and small, and the air filled with the drowsy hum of innumerable insects. The angler moves quietly about his business and sometimes sits with back against a tree and pipe in mouth doing nothing and enjoying every bit of it. In such moments wild creatures come into the open and disport themselves, sometimes almost within touch of the observer. A hare slaking its thirst in the river, a heron posing at the edge of a shallow, a water-rat at his dining table, a kingfisher flashing over the water, a beady-eyed lizard peeping out from his hiding place among the rocks, a Reed Warbler making melody near the water's edge, a snake, with head held high, swimming across the river, a twittering Tree Runner pursuing his spiral course round the bole of a tree—all these and many other creatures have I seen in the intervals of whipping the stream. If he is lucky the fisherman may even see the platypus, strangest of living mammals, swimming and playing in the quiet waters of a pool.

TROUT STREAMS OF NEW SOUTH WALES.

The trout is not indigenous to Australia, but it has taken kindly to its new home, and now in New South Wales alone there are over two thousand miles of well stocked stream where the angler may enjoy first-class sport. It was in 1888 that the Commissioners of Fisheries liberated some thousand or more of trout fry (obtained from Victoria) in the upper Shoalhaven, the upper Nepean, and other streams. In succeeding years a much larger number was liberated, and now the State has several hatcheries, and as many as half a million fry are distributed annually.¹

¹ H. K. Anderson, "History of the Trout in New South Wales," THE AUSTRALIAN MUSEUM MAGAZINE, III, 1927, pp. 86-89.



A nice two-pound Rainbow Trout.
[Photo.—C. Anderson.]

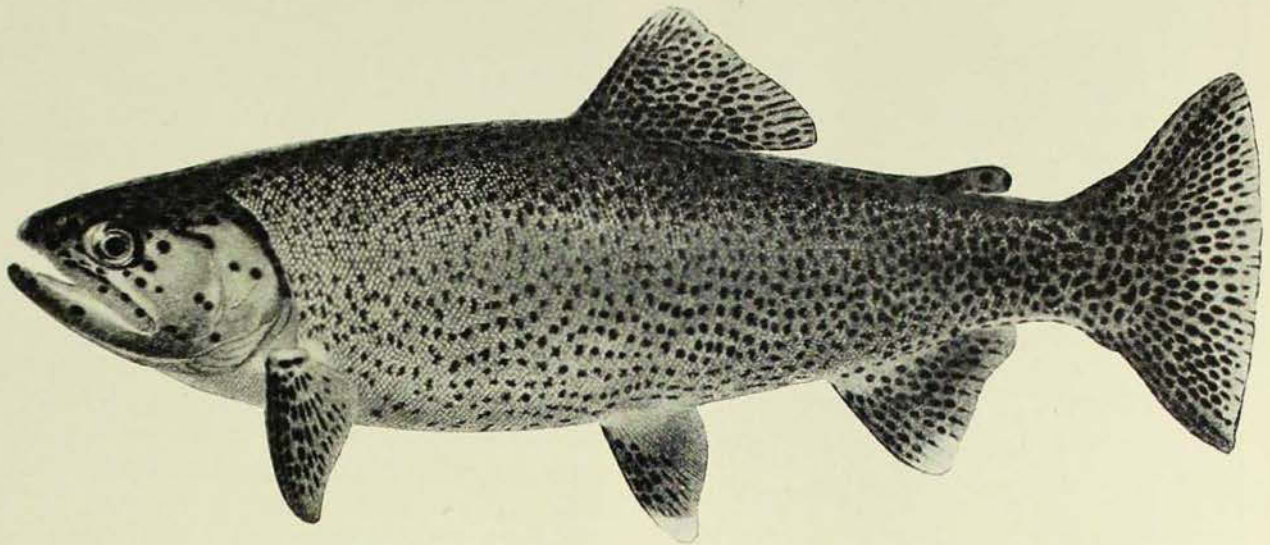
The rivers of the Monaro district, which have their source in the Kosciusko highlands, are eminently suitable for the trout, for the water, partly derived from melting snow, is cool, and there are many rocky and gravelly stretches such as trout love. The Snowy River and its tributaries are exceedingly popular with anglers and every year, early in November, a "Band of Hope" makes pilgrimage to the district with its miles of trout stream. The Murrumbidgee ("Big Water") River, which rises in Peppercorn Mountains, and the headwaters of which cover some thousands of square miles, is considered by some to be among the best trout streams of the world. West of the Blue Mountains are the Fish, Duckmaloi, Campbell and other rivers, which, being comparatively close to Sydney, are yearly visited by a number of city anglers, while more distant are the rivers of the New England tableland, such as the Styx, Macdonald, and Beardy, splendid streams, where good bags are sometimes obtained.

THE GOODRADIGBEE.

My own preference is for the Goodradigbee, or Little River, a tributary of the Murrumbidgee, which rises in the Kosciusko foothills, and, passing near the western edge of the Federal Territory, empties into Burrinjuck dam just above the wall. The very name, which in the aboriginal dialect means "water running over rocks," would indicate that this stream is well suited to the trout, which prefers clear running water, well aerated by cascades and rapids. There are no actual falls on the river, but here and there the stream is crossed by hard bars of porphyry and silicified slate, with, as one should expect, gravelly shallows above and deep pools below. The Goodradigbee is a beautiful river, pursuing its tortuous course among rolling hills, sometimes passing through a gorge, where the rocks plunge steeply downwards to the water's edge, and again bordered by flats, where a few settlers have established their homes. Along the banks grow tall river oaks, and in the settled areas willows droop gracefully over the stream. In places the trees completely span the river, so that the angler can pursue his sport in the shade, without Amaryllis, it is true, though not without danger of entanglement, not in Neera's hair but in the overhanging branches. There are delightful camping spots under the oaks, where sleep steals unawares on the tired fisherman, snug in his blankets and lulled by the murmuring waters and the night wind whispering in the tree-tops.

In the Goodradigbee are to be found Rainbow Trout (*Salmo irideus*), Brown Trout (*Salmo fario*), and Kern River Trout (*Salmo gilberti*), the last having been recognized lately by my colleague Mr. G. P. Whitley.¹ There are also Murray Cod (*Maccullochella macquariensis*), Macquarie Perch (*Macquaria australasica*), and Silver Perch (*Terapon bidyanus*), which gets the name of Grunter because of the snorting sound it makes when landed. All these are excellent eating, and all except the Murray Cod are good sporting fishes, but most anglers would award the palm to the Rainbow Trout,

¹ Whitley: *Austr. Zoologist*, V, 1929, p. 355.



The Kern River Trout; it resembles the Rainbow Trout, but can be distinguished by the larger size of the spots on the head and the greater density of the body spots.

[After Evermann; Hudson del.]

which even for its kind is a dashing and lively fish. It is a native of California, which, since its introduction into Australia, has flourished and increased in numbers, so that, in New South Wales at least, it is now the trout angler's chief quarry. It is a handsome fish, with iridescent body and a bright stripe, salmon-coloured or even deep red, along the lateral line. It is quick and decided in its movements, and, when it has made up its mind to take the fly or bait, it does so with a rush, usually hooking itself. The Kern River Trout is also a native of America, which has been acclimatized in New Zealand, whence it has apparently got to Australia by accident with a batch of Rainbow Trout ova.

Another fish which is sometimes unintentionally hooked is the "Slippery" or River Blackfish (*Gadopsis marmoratus*), which local anglers erroneously call a gudgeon. It was originally restricted to the waters flowing into Bass Strait, but has migrated across the divide into the Murray River system, and even penetrated into Queensland.¹ It is said to attain a weight of ten or twelve pounds, but it is usually no more than eight or ten inches long and a few ounces in weight. Trout fishermen dislike it, for it hooks itself so unobtrusively and makes so little fuss that the angler is often unaware that his bait has been monopolized, and it is also

rather a repulsive little fish, covered with a disagreeable slime. It can be recognized by its slender ventral fins, pale olive-green colour, and dark blotches.

METHODS OF CAPTURE.

There are as many ways of catching a trout as there are of writing tribal lays, and at some time or other I have practised most of them. I have even "tickled" a trout to its death, but, as this is a thoroughly reprehensible method, I shall not describe the technique. I am also one of the few who have killed a trout in the shallows by a lucky throw with a stone, and I have used that nefarious but efficient contraption the "otter," by means of which one can sweep the water with thirty or more flies simultaneously. But this was in another country and many years ago, and I hope I have long since expiated these sins. Fishing with natural bait, worm, grasshopper, wattle grub, or frog, has its attractions, and sometimes, when the artificial fly seems to have lost its attraction, and a dish of trout is ardently desired, one falls from grace and tries any or all of these lures.

FLY-FISHING.

But angling with the artificial fly is undoubtedly the most refined method of catching trout, demands the most skill, and gives the most satisfaction. The use of the artificial fly in fishing is a very

¹ J. D. Ogilby: *Mem. Queensland Mus.*, II, 1913, pp. 70-80.

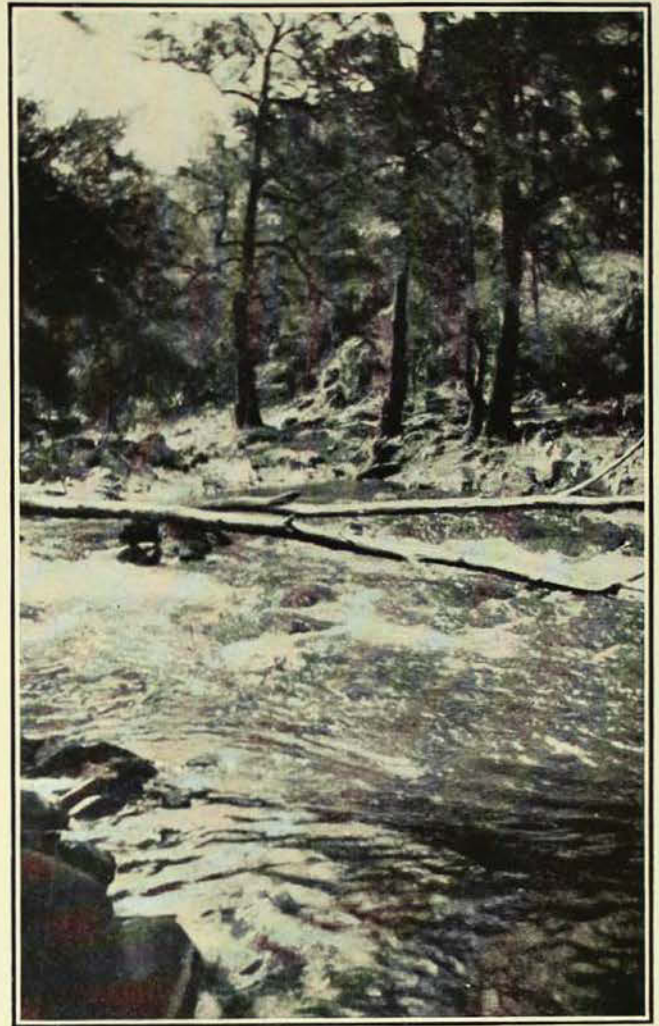
ancient art. The Roman writer Aelian, who lived 170–230 A.D., was apparently the first to make specific mention of an artificial fly, though it is possible that the honour belongs to Martial, who lived two centuries before, and in whose *Epigrams* is a passage which has been translated:

Who has not seen the scarus rise
Decoyed, and killed by fraudulent flies.

It may be that Martial referred to the use of a natural fly, but there can be no question but that Aelian had the artificial fly in mind, for he describes how the Macedonians made and used it:

“They fasten red wool round a hook, and fix on to the wool two feathers which grow under a cock’s wattles, and which in colour are like wax. Their rod is six feet long, and their line is the same length. Then they throw their snare, and the fish, attracted and maddened by the colour, comes straight at it, thinking from the pretty sight to get a dainty mouthful; when however, it opens its jaws, it is caught by the hook and enjoys a bitter repast, a captive.”¹

Much has been written regarding the relative merits of the dry and the wet fly. The dry-fly fisherman claims that his method is the fine flower of the angler’s art, and indeed the only proper manner in which to catch a trout; a real hard-boiled dry-fly angler will not knowingly eat a trout caught in any other way. It is interesting and instructive to watch him at work. Proceeding upstream he watches keenly for any signs of a rising trout. He then casts his fly, which is cleverly fashioned so as to resemble an actual fly as nearly as possible, so that it drops lightly just above where the trout rose. It floats downwards with wings erect, looking much more tempting than a real fly, and, should it be sucked down by the poor fish, with a quick turn of the wrist the angler strikes the hook home and joins issue. Should, however, the cast be unsuccessful, the fly will soon become wet and sink. The angler then whips his line through the air five or six times to dry it and the fly before he tries again. The great art is to make



A rapid on the Goodradigbee.

[Photo.—C. Anderson.]

the fly look and behave as naturally as possible, and the angler must make a close study of the way of a trout with a fly and present his lure in such a manner that the trout just *has* to take it. Should the fly, for example, drag ever so slightly, any trout of average intelligence will know it for the fraud it is—or so we suppose. If the water shows one or several rings, which indicate that the trout are feeding, and if he can discover what the food is and has in his collection a close imitation, all is well, and with average luck and the skill born of long practice the dry-fly “purist” may have good sport, fill his basket, and so to bed with a righteous feeling of good work well done.

But there is another side to the picture. The trout may not be feeding at the surface, and the angler may tramp for miles without a single ring appearing on

¹Radeliffe: “Fishing from the Earliest Times,” 1926, p. 188.

the water to gladden his eyes. If he is a true dry-fly man he does not fish when the trout are not rising, for he thinks it unsportsmanlike to catch a sitting fish as it were. On the other hand, the wet-fly fisherman allows his fly to sink a foot or two, then retrieves it in short jerks to imitate an insect making its way to the surface. With a wet fly every foot of the river can be systematically fished, and it does not matter whether the trout are rising or not. Thus the wet-fly man may secure a fair basket, while the dry-fly enthusiast is raising blisters only. Yet the dry-fly angler looks down on the devotee of the wet fly, and both despise him who uses the vulgar worm; fishing with worm or grasshopper they regard as the contemptible man's recreation.

FISHERMEN'S TALES.

Every angler has his memories of triumphs and disappointments, and of large trout which escaped with hook and a goodly length of cast. It is well to listen sympathetically to a friend when he talks feelingly about the big fellow who got away, for you never know when you may want to relate a similar experience to him. The late Lord Dewar said "eating fish stimulates the brain, fishing stimulates the imagination," but I believe that, as a rule, anglers are "very honest men," and that John Cunningham is too severe when he writes:

And auld Ananias could tell a guid lee,
Though for angling he had nae ambition,
But it seems his descendants a' cast a bit flee,
Frae the tales that you hear at the fishing'—
Gosh—

You hear some dam'd lees about fishin'.

So I hasten to confess that I have never caught a trout over five pounds; to be honest, my biggest was only a little over three—and it was not even that until some weeks later.

One of my most exciting experiences was when, in trying to land a sizable trout from a pool on the Goodradigbee, I slipped off the rock on which I was standing and joined the hooked one in deep water. By the time I had swum ashore and retrieved my rod the line was hopelessly snagged round a sunken log. I made

sure the trout was lost, but, peering down into the depths, I could now and then see a white flash, as he turned in the water on the end of a short length of free line, showing that the hook and he had not yet parted company. Blessing the stout cast, I dived down upon him, got my thumb and forefinger into his gills, and disentangled the line before coming to the surface, gasping but triumphant. Possibly this method of landing a trout is unorthodox, but I needed something for dinner.

In every river there is a trout, always a large one, which seems to bear a charmed life. All the old hands know him and generally refer to him by a pet name, possibly Herbert. On my first visit to the Goodradigbee, just above Wee Jasper, I had a short interview with one of these veterans. A large tree had succumbed to flood waters and fallen into the river from a steep bank, taking a large mass of earth with it, so that it formed a small island and left a deep pool where it had stood. Walking along the bank with my eye on the river I saw a large trout poised among the submerged roots of the fallen tree. It was a snaggy pool, but there was no better hole in sight at the time, and I dropped a fly over his speckled majesty. He cocked an eye at it but made no movement. In succession I tried several different kinds of fly with the same result. Then, abandoning my principles, I impaled a grasshopper and let it sink in front of his nose. He accepted this time and I duly hooked him, but, alas, the affair terminated abruptly, and I lost a hook and about two feet of cast. A friendly native, who had been watching the performance, soothed my ruffled feelings by informing me that that was old Clarence, and that he had often been hooked but always managed to get away.

Many a fisherman has wished at times that the water could be drained away temporarily so that he could see what fish were in the river and what they were up to. Failing this, one may discover a good deal by looking down into a pool from a height. Along the Goodradigbee there are several spots where a rocky bluff stands steeply on the edge of a pool and from the top one can have an

"aeroplane" view into the water. On my last visit I had been working such a pool without getting a rise and had decided that there were no fish in it. But, climbing up on the rocks and looking down on the sun-flecked water, I presently saw a dark form sailing majestically across a light patch; it was a large perch, nosing around in its deliberate way. Hastily baiting with a worm, I dropped it over him and let it sink. He made a short run and "propped." A jerk drew the bait away and he followed, keeping, however, a short length in the rear, then he turned and made off. Presently, however, he appeared again and the tactics were repeated, and this time he made a rush at the bait, his white leathery-looking mouth wide open, and hooked himself. As he rushed frantically round the pool he was joined by a mate, for the Macquarie Perch, unlike the trout, is gregarious, and soon both were safely landed. Then appeared a Silver Perch, which, however, refused to be tempted. Then followed a medium-sized trout, which also fell a victim. Then, with a thrill, I saw a large trout dart into the pool from the shallows, and presently he was joined by another, slightly smaller. Some more perch had appeared by this time, and a number were added to the catch. But I keenly desired to hook the larger trout, so changed back to a fly and tried my all of cunning in vain. In desperation I captured an unfortunate grasshopper, fastened it on the hook, and dropped it into the water. In my excitement I miscalculated the distance and the bait sank some four or five feet away from the trout; I could see him plainly, lying near the surface. Then, like a flash, he dived downwards in a beautiful curve and made a savage rush at the bait, carrying half of the grasshopper away but missing the hook. By this time the afternoon was drawing to a close, and, as the white moths were beginning to appear on the water, I decided to try one of mine. Several casts were resultless and I made up my mind to give him up after one more attempt. To my delight this time there was a surge and a singing reel as the hooked trout raced across the pool and out into the shallows. After a short sharp tussle I had the satisfaction

of landing a two-pounder in fine condition. This experience shows that a pool which seems for a time to be empty of fish may yet have unexpected possibilities.

It is known that certain trout, especially the larger ones, have a regular beat, or a favourite pool where shelter and food are assured and where the smaller fry dare not trespass. Near camp was a promising spot, where, just below a shallow boulder-strewn stretch, a fallen tree lay across the head of a deep pool. When I discovered this pool in the early morning after my arrival on the river, I told myself that, if I were a trout, I should regard it as very eligible quarters, where one could depend upon a steady supply of food in the insects dropping ever and anon from the branches and twigs of the tree. And, sure enough, under my very eyes and only a few feet away, a trout rose quietly, gulped, and disappeared. Hastily I dropped a fly over that trout, and in a few seconds I had him hooked, and later had the pleasure of his company for breakfast. But I tried in vain for another rise. However, on each succeeding morning, this pool yielded a single trout, never less than a pound in weight. This, I think, indicates that a suitable spot is never long without a tenant. Next year I paid an early visit to my lucky pool as I called it, but found that in the interval the fallen tree had disappeared, and not a single rise rewarded my efforts.

THE FOOD OF TROUT.

Most anglers perform a *post mortem* on their catch, partly out of curiosity and partly in order to glean some information which may assist them in selecting a successful lure. But the average fisherman is no entomologist and can barely recognize some black scales as the mortal remains of a beetle of sorts. This year, however, I provided myself with a bottle of spirits, to which I transferred the stomachs of a number of trout and perch. These I submitted to Messrs. A. Musgrave and K. C. McKeown, of the Museum staff, and Mr. H. J. Carter, B.A., Honorary Entomologist, and I am much indebted to these gentlemen for their painstaking labours in identifying the,

in general, fragmentary remains. Not all were fragmentary, however, for some were in such good condition that it was found possible to mount them in orthodox manner as museum specimens, and Mr. Carter was delighted to find among them a new species of beetle belonging to the family Dryopidæ, the members of which, originally terrestrial, have developed aquatic habits. It was found that the food of the trout and of the Macquarie Perch is very similar, and a list of the stomach contents of three trout will give some idea of the diet of these fishes. No. 1. Vegetable matter; several Pentatomid and Coreid bugs; a Corixiid (Water Boatman); a Leaf-hopper, *Eurymeloides*; several ants, including species of the genus *Camponotus*; a bee (? *Hylæus*); an ichneumon fly, *Paniscus*; beetles belonging to the families Scarabæidæ, Elateridæ, Chrysomelidæ; a Neuropteroid insect. No. 2. Seven ants, including five specimens belonging to the genus *Camponotus*; an ichneumon, *Paniscus productus*; an immature grasshopper; several Dryopid beetle larvæ; insect debris, including legs of grasshoppers, caddis-fly cases, one caddis-larva skin; one small spider. No. 3. Demoiselle dragonfly; two mature caddis-flies and four caddis cases; one May-fly; three ichneumons; one ant; five Dryopid larvæ; three immature Leaf-hoppers; one spider.

COOKING OF TROUT.

There are many ways of cooking a trout. The usual method is to fry it in a pan, and certainly a nicely browned trout is a pleasing spectacle. When one is away from camp, or a pan is not available, the

"bushman's gridiron," which consists of a few green sticks placed crosswise on the coals, is not a bad substitute. But the simplest and I venture to say best method is to wrap the fish in wet paper and bury it in hot ashes. The steam from the cooking fish keeps the paper damp, and after eight or ten minutes, depending on its size and the quantity and temperature of the ashes, the trout is done to a turn. When the paper is unwrapped the fish is found to have preserved its original fresh appearance, and the skin can be peeled off just as one peels a well boiled potato, obviating the necessity of preliminary scaling.

Of course there are more elaborate and expensive methods, and the gourmand may prefer Izaak Walton's recipe for cooking and dressing a trout described in his *Compleat Angler*:

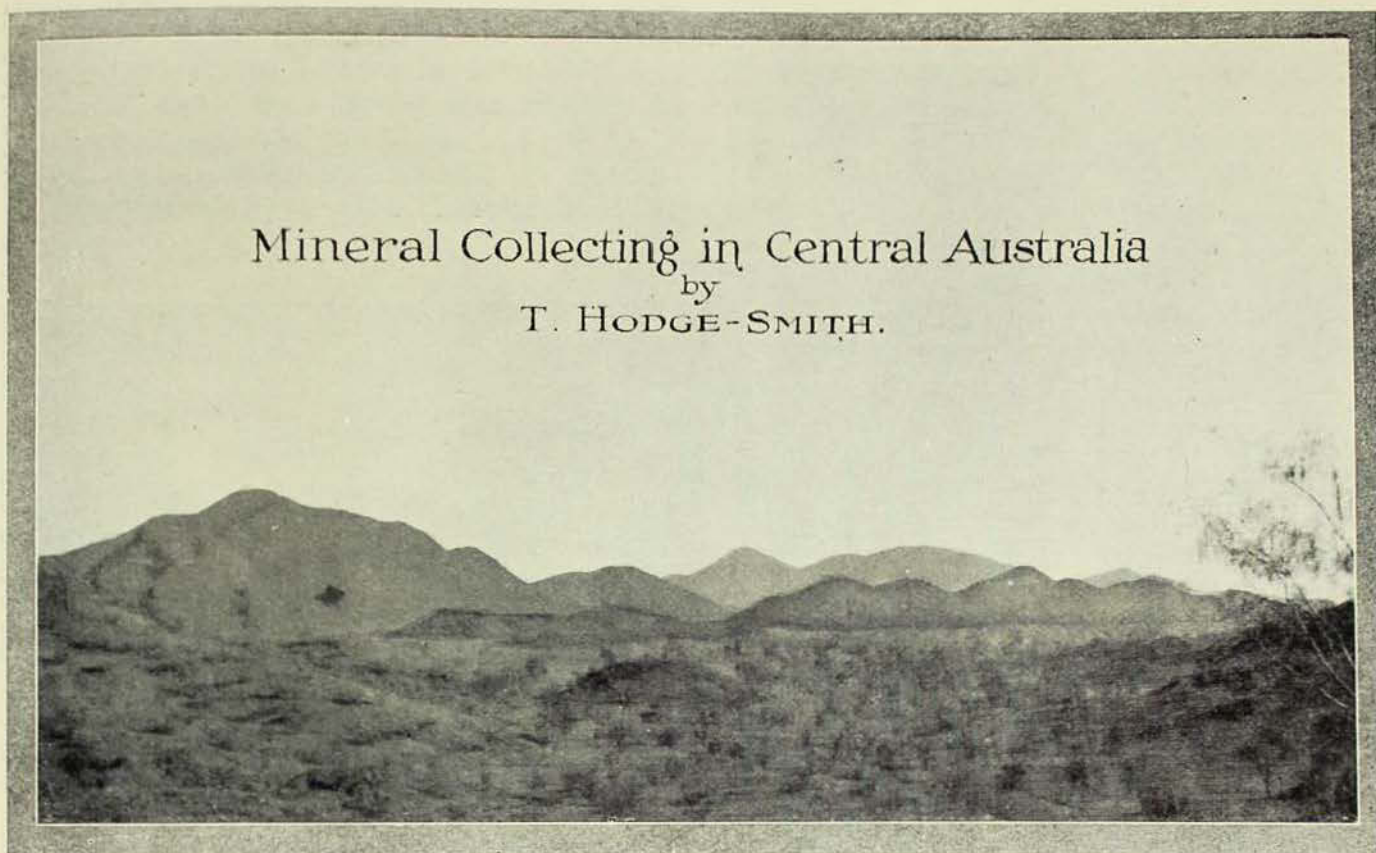
Take your trout, wash, and dry him with a clean napkin; then open him, and having taken out his guts and all the blood, wipe him very clean within, but wash him not, and give him three scotches with a knife to the bone, on one side only. After which take a clean kettle, and put in as much hard stale beer (but it must not be dead), vinegar, and a little white wine and water, as will cover the fish you intend to boil; then throw into the liquor a good quantity of salt, the rind of a lemon, a handful of sliced horse-radish root, with a handsome light faggot of rosemary, thyme, and winter savory. Then set your kettle upon a quick fire of wood, and let your liquor boil up to the height before you put in your fish, and then, if there be many, put them in one by one, that they may not so cool the liquor as to make it fall. And whilst your fish is boiling, beat up the butter for your sauce with a ladlefull or two of the liquor it is boiling in. And being boiled enough, immediately pour the liquor from the fish; and being laid in a dish, pour your butter upon it; and strewing it plentifully over with shaved horse-radish and a little pounded ginger, garnish the sides of your dish, and the fish itself, with a sliced lemon or two, and serve it up.

Dr. Eland Shaw, a well-known authority on the Blattidæ (Cockroaches), has presented to the Museum his collection of works and papers on that group of insects as well as his indexed notes. This is a very valuable donation, and we are greatly indebted to Dr. Eland Shaw for his generous gift.

Recent installations in the Ethnological Galleries include a collection of Tasmanian stone implements, the gift of Mr. J. S. Falkinder, and a series of specimens illustrating the stone-flaking industry of the Australian aborigines and its evolution.

Mineral Collecting in Central Australia

by
T. HODGE-SMITH.



A typical scene in the Hart Range. At the foot of the small hill in the centre our mica camp was situated.
[Photo.—T. Hodge Smith.]

BY the invitation of the Mica Corporation of Australia Limited, and the financial assistance of a number of generous donors, I was enabled to accompany an expedition to Central Australia for the purpose of studying the occurrence of mica and collecting for the Museum.

Leaving Sydney by motor lorry, our party, which consisted of Messrs. J. Dale, R. Barlow, and myself, headed for Bourke, and then through central Queensland to Cloncurry in the far north-west of that State. From here we proceeded to Urandangie on the Georgina River and near the Queensland—Central Australian border fence. Passing through this fence at about latitude $21^{\circ}54'S.$, we found ourselves in a country that looked anything but inviting. It was flat, save for a few low-lying flat-topped ridges indicating the level of the old peneplain. It is true that we were in a forest in the tropics, but it would be impossible to describe it as a tropical forest, for that immediately

brings to one's mind a picture of huge trees with great thick creeping vines, and an undergrowth that the sun seldom penetrates. No, it was a "gidgee" forest, and the gidgee tree is a gnarled twisted thing, seldom reaching a height of more than ten feet, and affording little or no shelter from the burning sun, and the dense undergrowth was replaced by bare ground, with here and there a few tufts of dried grass.

It was in this country that we came across a cattle station, Tobermory. No doubt the original settler gave this name to his station in memory of his home town in Scotland, but what a contrast!

After travelling eighty miles west of this station, a distance which, incidentally, took us five days to accomplish, we sighted our first range of mountains, the Tarlton Range. They were not very inspiring, being probably about eight hundred feet above the surrounding country, and presenting an even skyline, with only

one gap to be seen, through which we passed.

It will not be hard to imagine our joy when on passing through the Tarlton Range we found a large water-hole in the Arthur River. It was only a little more than waist deep at its best, but it provided the most enjoyable swim that I have ever experienced, and it acted like a charm on the party, for we were beginning to feel the strain of a most strenuous week.

Leaving here, we pushed on to the Jervois Range, which has received some publicity of late because of the discovery of copper and silver-lead lodes. The little mining town boasts of a boardinghouse, a store with, of course, its bar, and a butcher's shop.

Each of these establishments would provide a good story in themselves, but that hardly comes within the province of mineral collecting. However, I cannot resist the remark that the running of a boarding house in these parts is no sinecure. The good lady, the only woman on the field, does all her cooking in the open, with absolutely no shelter from a tropical sun.

The mine manager, Mr. Harvey, very kindly spent half a day with me, taking me around the various leases. The outcrop stands in bold relief from the surrounding country, reaching a height of perhaps one hundred and fifty feet. The country rock consists of Pre-Cambrian schists into which the ore bodies have been injected along lines of weakness, and have replaced the schist in places. These ancient rocks have been much folded and possibly in places faulted, and on looking along the outcrop, one does not see a continuous line of lode but a series of sub-parallel lenses with a general north and south trend. I was given

permission to collect whatever I desired, with the result that our collections have been enriched by the rare mineral pyromorphite (a chloro-phosphate of lead), the beautiful blue and green carbonates of copper, and a score of other minerals.

After I had delayed the expedition as long as possible, we began the ascent of the Jervois Range, eventually reaching



Our first view of Central Australia at the Queensland border fence, sixty miles south of Lake Nash. A typical "gidgee" forest.

[Photo.—T. Hodge-Smith.]

the central plateau, which has a general level of about 1,500 feet above sea level. It was on this tableland that we encountered the largest termite nests seen on the whole trip, though they do not compare in height with those found near Darwin, North Australia. Here also we came across a huge natural wall some sixty feet in height, and about nine miles in length. Originally it was a molten mass which had been injected into the rocks of the area, probably along a line of weakness. Subsequently the softer rocks have been weathered away much more rapidly than the more resistant solidified igneous rock, leaving it standing as a huge wall or dyke about a chain thick.

Passing through a gap in this wall we very soon came to granite country. At Oorobbra Water-hole a valley has been cut into the granite, and the most fantastic caves and water-holes have been formed. At this oasis bird life abounds, and we saw ducks, the rather rare Major Mitchell Parrot, Galahs, and

numerous small birds that a mere mineralogist could not be expected to know. In the caves there was ample evidence of the existence of bandicoots, etc., though I must admit that I never saw any, and that they treated our traps with complete scorn. At night we heard the mournful cry of the Curlew, and I was informed that we might sleep soundly,

for the aborigines regard this bird as a "debil-debil" bird. However, we slept soundly every night, for I doubt if there is an "uncivilized" black in the whole of the country that we passed through.

Crossing the Marshall and Plenty Rivers we came to the Hart Range, the scene of our labours for the next month. Incidentally, these rivers are full of interest, if not of water. The Plenty is the show river of the district, not because of any water that might be seen, for it is only on the rare occasions of flood that it contains any water at all, but because water can be obtained by digging almost anywhere in its sandy bed. Where we crossed it, it is about three-quarters of a mile wide. Like the Marshall, it flows east, joining the south-flowing Hay River, which eventually loses itself in the sands of the desert north of the South Australian border.

The general level of the Hart Range is a little over 2,000 feet above sea level, with quite a number of peaks rising another thousand feet above this level. The longer axis of the range runs approximately north by east and west by south. The rocks are Pre-Cambrian in age, that is to say, they belong to the oldest group of rocks that we know of on our earth, and would be of the order of 1,400 million years of age. Naturally



Travelling across the treacherous sandy plains of Central Australia is no easy task. Without warning, the lorry would settle down by the stern, causing long delays.
[Photo.—T. Hodge-Smith.]

rocks of this age have been subjected to all sorts of vicissitudes, and have suffered mostly through extreme pressure exerted over a very long period, and have doubtless been buried to such tremendous depths that they have been in a more or less plastic state. Mr. E. C. Andrews, Government Geologist and a Trustee of this Museum, has called attention to what he has termed a zone of rock flowage, as illustrated by the rocks of the Broken Hill district, which are of similar age to those of the Hart Range. Ample evidence of this rock flowage can be seen in the Hart Range.

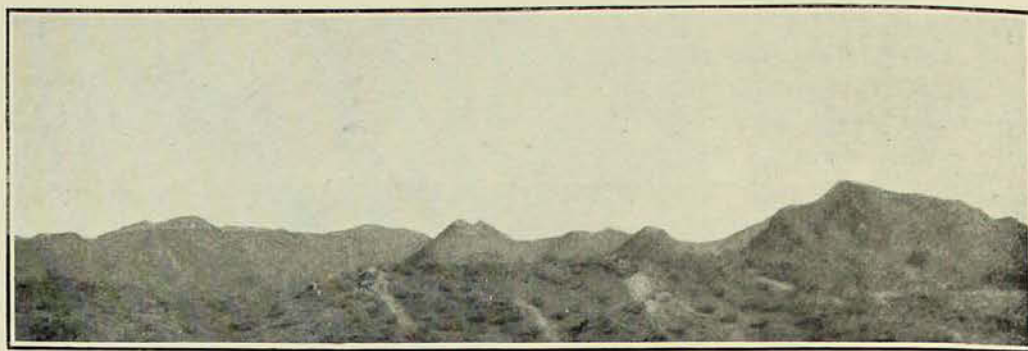
Of course, it is not hard to realize that the original character of these rocks has long since been lost. In some cases it is difficult even to be certain whether the rock was originally igneous or sedimentary. What might have been originally a shale from which excellent bricks and tiles could have been manufactured is now a mica schist containing innumerable crystals of garnet, and again a granite, which may have been a beautiful building stone, is today a contorted gneiss also containing garnets.

Not only have the rocks been subjected to pressure which has so effectively camouflaged their original state, but they have been intruded by molten igneous rock coming up from great depth and under considerable pressure. This molten material,

forcing its way along lines of weakness in the schists and gneisses, has been able to gnaw its way through by dissolving or assimilating the country rock. These injections took place after the rocks had been converted into their present state,

but at a time when they were buried under an enormous thickness of rock, for we know that the attacking material must have cooled at an extremely slow rate. Today the evidence of this second attack on the ancient rocks is to be seen in the numerous pegmatite dykes cutting through them in every direction, while the large size of the constituent minerals of the pegmatite tells us of the slow cooling rate. The dyke rock is composed of quartz, felspar, and mica, though it is not always that all three minerals are present together. Sometimes only quartz is to be seen, while again quartz may be entirely absent, while in some dykes we may find a peculiar intergrowth of quartz and felspar, known as graphic granite, because certain sections exhibit markings said to resemble Hebrew writing.

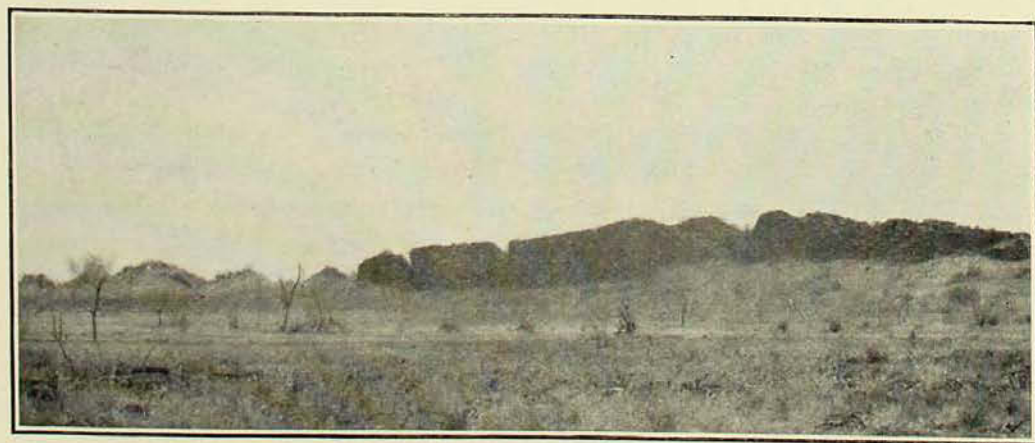
The most important mineral of the pegmatite is the mica, because it occurs here in such a large size and of such a



A view of the Hart Range, Central Australia. The light coloured streaks in the central foreground are pegmatite dykes, some of which carry payable mica. [Photo.—T. Hodge-Smith.]

quality as to make it of very great commercial importance. Two varieties of mica occur in this area, biotite and muscovite; the former is black and opaque even in fairly thin sheets and is of no commercial importance, while the latter is colourless in thin sheets, though often it is tinged with a ruby, amber, or green colour, and is the valuable variety. Muscovite is by far the more common variety, though it is not always found in such sizes and quality as to be worth mining.

From my observations, it would appear that payable mica exists only where the dykes cut through typical schist. Under these conditions mica is found to occur as large crystals or "books" as the miner calls them. His name is an apt one, for mica possesses a perfect cleavage in one direction, so that these books may be split quite easily into any number of sheets or "leaves." Rarely books weighing several hundred-weight are found, and there is in the Museum mineral gallery a sheet of mica from such a book measuring approximately three feet by two feet six inches. More commonly we find books from which it is possible to obtain sheets measuring up to, say, six inches by six inches.



This is not the ancient wall of China, but the much more ancient wall of Central Australia. A granite wall approximately nine miles long, sixty feet high and twenty feet wide, formed by the greater resistance of a dyke to weathering than that of the surrounding country.

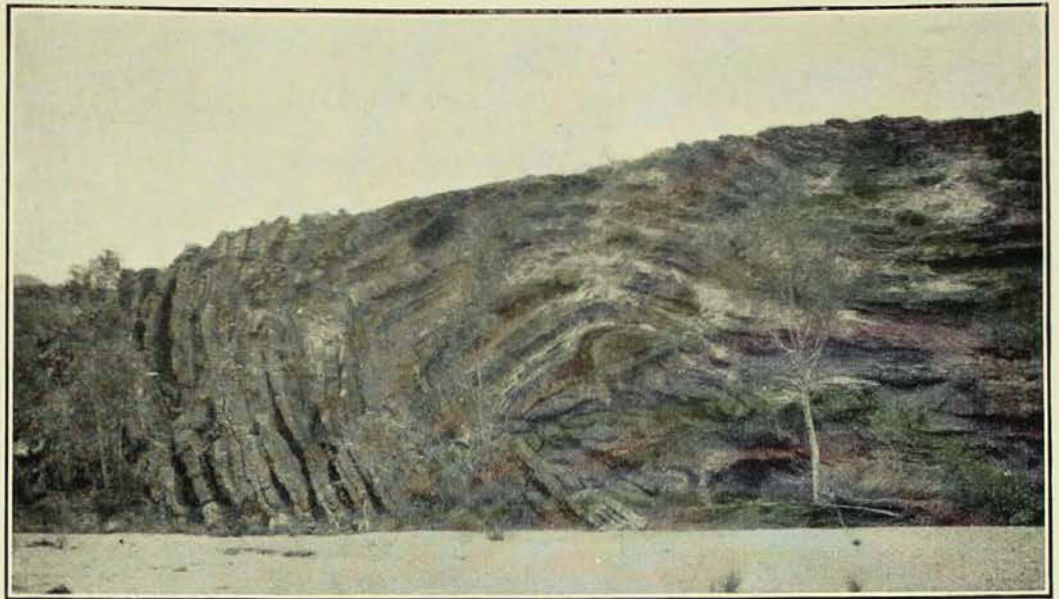
[Photo.—T. Hodge-Smith.]

When the miner finds a large book of muscovite in the face of his mine, he is not always sure that it is going to be of any value. The mica may be badly "stained," that is, it has exceedingly thin inclusions along the cleavage planes which greatly detract from its value. Sometimes a second cleavage or parting, at right angles to the principal cleavage, forms thin strips

on splitting, known as ribbon mica. Again, a book may be spoilt by containing other minerals. For instance, I collected mica containing such minerals as beryl, garnet, tourmaline, and quartz.

Mica has many uses, but it is principally used as a non-conductor of heat and electricity. Thus it is used as transparent material in doors of furnaces, stoves, etc., and as insulating material in electrical apparatus, such as the armatures of dynamos, electric irons, spark plugs, and a host of other electrical gear.

Returning to the ancient schists and gneisses, we have seen how they have been buried to great depths and have been lifted to heights, perhaps not so great, so that today we find them three thousand feet or more above sea level. It is because of their present elevated position that they are fighting their last battle against the tremendous forces of nature, which this time consist of wind, rain, and extremes of temperature. Very slowly, but none the less surely, these forces are turning the rocks into a red sandy soil, which every rain storm helps to wash away, until some day they will be no more. However, there is one constituent of these rocks that is withstanding the action of weathering to a much greater extent than the rest of the rock, and that is the garnet.



A cliff face in the White Range, Central Australia, showing how the ancient rocks have been twisted and folded.

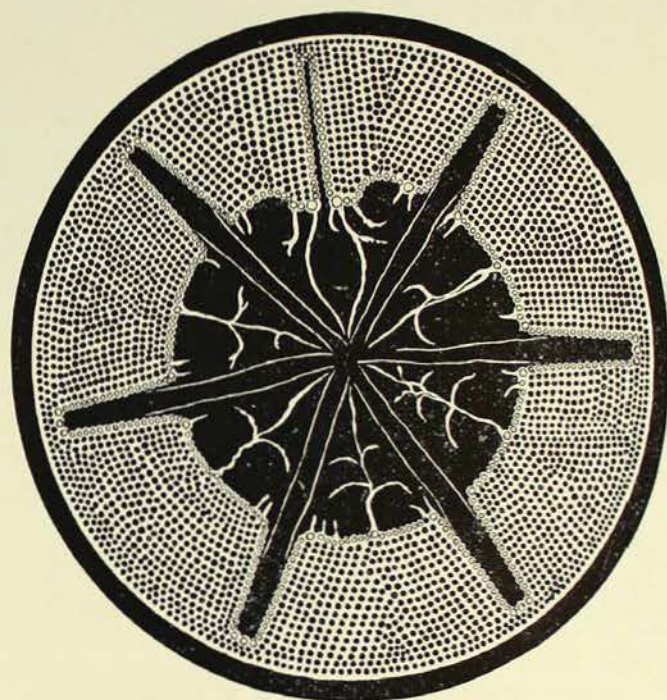
[Photo.—T. Hodge-Smith.]

The reason is to be found mainly in the great hardness of this mineral. In some places it is possible to pick up these weathered-out garnets literally by the bucketful without any great effort. Nearly all these stones are quite useless from the point of view of a gemstone, but occasionally, as at the Florence River, garnets of gem quality are to be found. These stones are red or brownish in colour, and sometimes display the pigeon-blood red of the ruby, and for this reason they are often called rubies. They are not real rubies. Just as the sapphire is the blue variety of corundum (aluminium oxide), so the ruby is the red variety of corundum. On the other hand, the garnet is variable in composition, and there are two principal varieties of precious garnet, pyrope (magnesium aluminium silicate), and almandite (iron aluminium silicate). So far as I have been able to ascertain, the only variety of precious garnet to be found in the area is pyrope, but it is quite possible that the other variety exists. Another important difference is that although the garnet is very hard, it is inferior in hardness to the true ruby. Notwithstanding all this, some very beautiful stones have been secured showing an excellent lustre and colour.

Diatoms

By H. FORDHAM,
Microscopical Society of New South Wales.

DIATOMS are microscopic unicellular organisms composed of two opposite plates or valves, generally convex, and of an interposed third segment, forming together a miniature box of a siliceous nature, enclosing a soft organic matter, rarely green, but sometimes yellowish or orange brown in colour. They inhabit fresh, salt, or brackish water. They were classed by Ehrenberg amongst the Bacillaria, and have been adopted at times by various biologists in both the animal and vegetable kingdoms, and this has been embodied in a controversy as to the boundary line between plants and animals which appears to be incapable of settlement. Indeed, Delage has well expressed the opinion that "The question is not so important as it appears. From one point of view, and on purely theoretical grounds, it does not exist; while from another point it is insoluble. If one be asked to divide living things into two distinct groups of which the one contains only animals, the other only plants, the question is meaningless, for plants and animals are concepts which have no objective reality, and in nature there are only individuals. If, in considering those forms which we regard as true plants and animals, we look for their phylogenetic history, and decide to place all of their



Asteromphalus brooki. ($\times 710$)

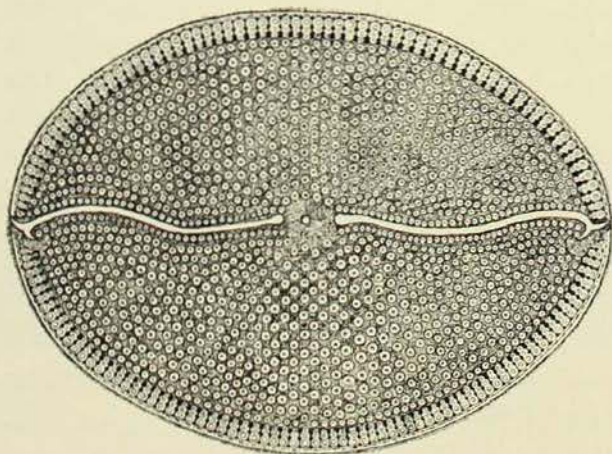
[H. Ross, del.]

allies in one or the other group, we are sure to reach no result; such attempts have always been fruitless."

Diatoms have an immense number of shapes, wandlike, trapezoid, square, round like pill-boxes, almost globular, boat-shaped, oval, egg-shaped, discoid, wedge shaped, triangular, and formed in many irregular ways. They also vary greatly in size and exist principally in three forms, as single isolated free frustules, frustules attached to stalks, or in chains connected by a gelatinous substance.

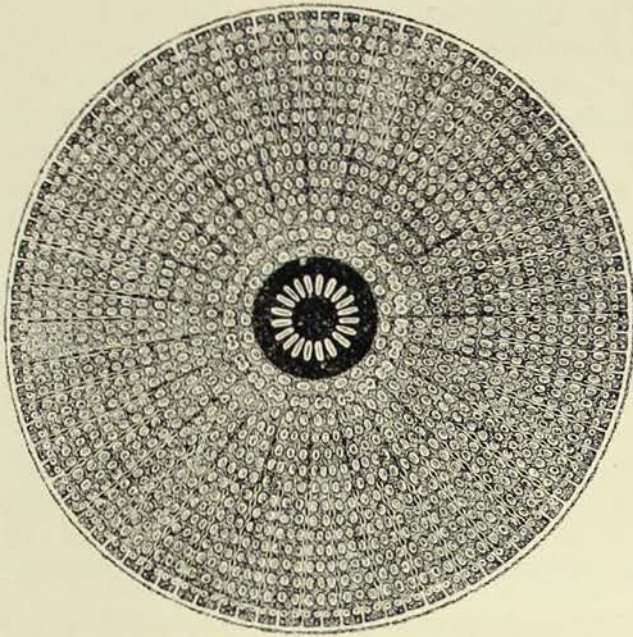
The outer wall is siliceous and is unaffected by a red heat or strong acids, and these properties allow them to be easily cleaned and mounted as objects of never-ending interest to the microscopist. They are generally very beautifully sculptured with dots and furrows, making wonderful patterns.

Diatoms move freely when alive, and there has been much discussion regarding their method of locomotion. Ehrenberg believed that a single locomotive organ



Cocconeis sp. ($\frac{1}{179} \times \frac{1}{263}$ in.)

[H. Ross, del.]



Arachnoidiscus Ehrenbergii. ($\times 400$)
[H. Ross, del.]

like the foot of a snail protruded. The use of cilia has been advanced as a means of movement and the employment of extraneous hyaline threads, and also the taking in and the emission of fluid matter.

It is now generally considered that the outer protoplasmic coat possesses an inherent twitching movement that is continually going on during active life and upon touching any surface gives sufficient power to move them forwards or backwards with a caterpillar-like action.

This movement of diatoms is fascinating to watch under the microscope. It appears to be a steady sliding progression, either backwards or forwards in the line of formation of the diatom. There is considerable power to push aside objects which lie in its path, though its own progress appears to be readily checked should it be engulfed by an amœba. It is killed instantaneously by a drop of weak solution of formalin.

There has been argument as to whether or no the power of reasoning comes into the movement of diatoms. It is generally denied, although the movements of a common kind such as *Navicula*, when entangled in *débris*, appear to be purposeful enough.

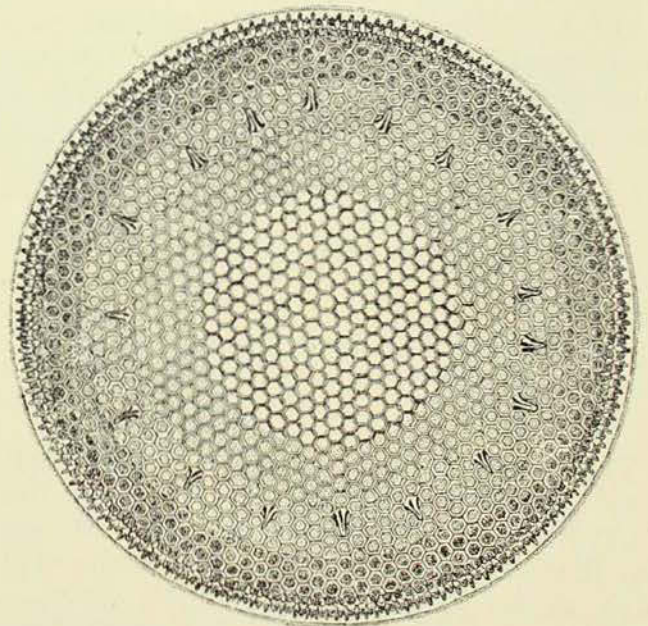
Time after time the individual has been seen attempting to free itself from rubbish to which it has become attached. It

at first goes straight ahead in an endeavour to leave its encumbrance behind. Finding this fruitless, it reverses, like a true ship going astern. These tactics failing, it pauses for a few seconds during which time its burden seems to have been fastened down to the glass slide, possibly by some sticky secretion, for on going ahead again it is left behind and the diatom is free once more.

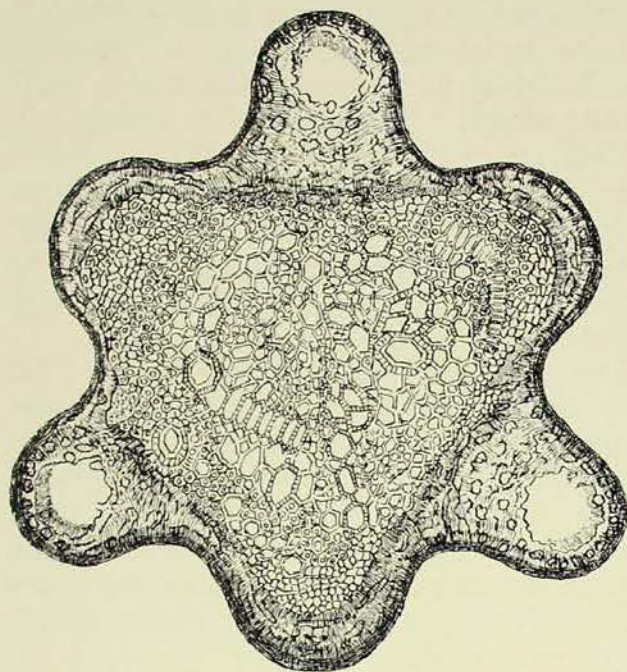
The habitats of the diatom are the most extensive and various of any organic beings. They are found in fresh, salt, and brackish waters, about the roots of plants, and in moist earth. The siliceous skeleton remains uninjured for centuries and occurs in most rocks, excepting those which intense heat has fused into a molten mass.

On summer days diatoms frequently rise to the surface of the water in the form of a mass of scum. They may be obtained from the stomachs of fish and molluscs, and species have been found in the ice of the Polar regions. Guano deposits are rich hunting grounds and the roots of mangroves are often covered with them.

They are so numerous as to have more importance in the physical history of the earth than the larger animals and trees, and have formed pure deposits many feet thick although more than one hundred million hardly weigh a grain.



Cocinodiscus sp. ($\times 384$)
[H. Ross, del.]

*Triceratium* sp. ($\times 725$)

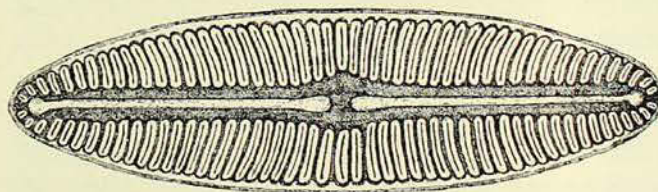
[H. Ross, del.]

The remains of diatoms are used commercially in different ways, such as for polishing powders, scouring soaps, and fine grades of oilstones. They also have a great hygienic value in keeping bodies of water in a sanitary condition, giving off as they do large quantities of oxygen in sunlight. In eastern Europe and portions of Asia diatomaceous earth was used as a food. The diatomaceous earth was blended with flour, and, though it doubtless made a filling meal, it could not be a sustaining one since it is not nutritive.

In New South Wales there are rich deposits of diatomite, principally at Cooma, though there are others at Barraba, Coonabarabran, and Lismore.

The movements of the diatom known as *Bacillaria paradoxa* are perhaps the most singular of any, and a drop of water containing some of these brisk organisms will provide much entertainment. *B. paradoxa* is like nothing so much as a collection of a dozen or so laths laid evenly side by side when at rest. When it moves, the outer lath slides forward until it reaches the end of the one next to it, that in turn slides forward, and then the next and the next, until they are stretched out in one straight line. They move forward like this until they touch some object, and then they close up again with a similar action and proceed to project themselves in the opposite direction.

Collected diatoms to be treated in order to obtain the siliceous skeleton for mounting as microscopic slides must be boiled in nitric acid until there is hardly any moisture left; they should then be washed in several changes of water, most of which can be drained off through fine silk. It is comparatively easy to separate them on a slide by means of a bristle fixed in a handle, and they can be arranged and mounted in Canada balsam or Styra.

*Navicula* sp. ($\times 500$)

[H. Ross, del.]

The Microscopical Society of New South Wales, which holds its meetings in the Australian Museum Lecture Theatre on the first Thursday in every month, will have as its principal feature on May 7, at 8 p.m., an address by Mr. T. C. Roughley on "The Embryology of the Oyster."

The lecturer has devoted considerable time to research upon the oyster, and members, likewise prospective members, are invited to be present.

At the April meeting Dr. E. B. Jones lectured upon "Pathogenetic Bacteria."

Asbestos: Its Occurrence and Uses

By O. CHALMERS,
Assistant, Department of Mineralogy.

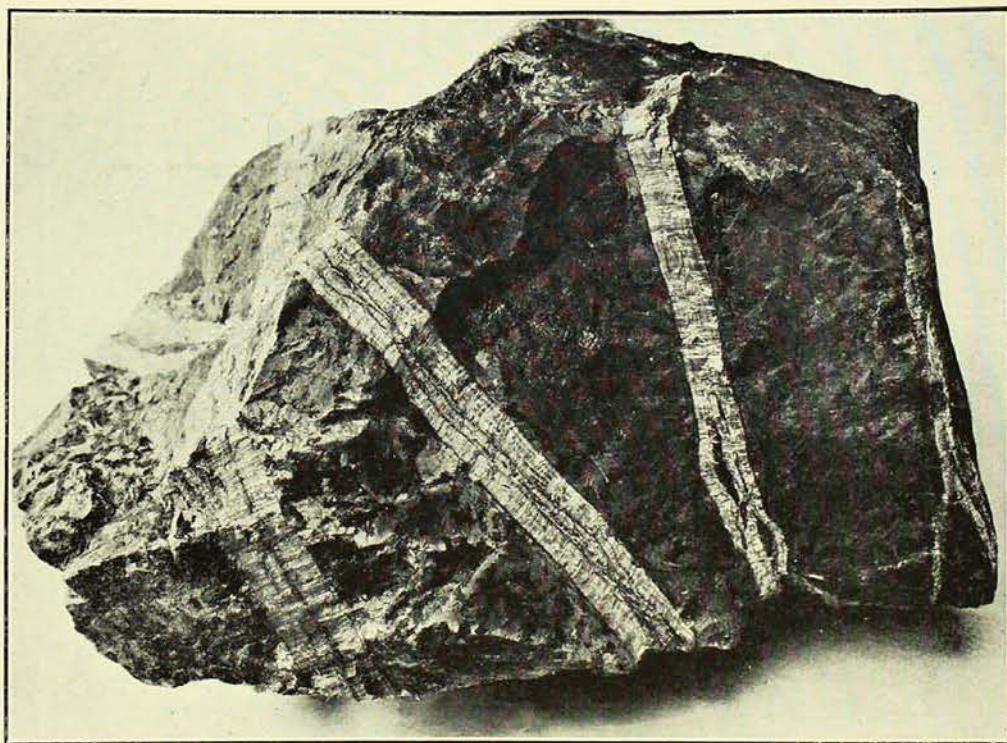
COMMERCIALY speaking, asbestos is a mineral which is prized mainly on account of its possessing the following valuable properties:

- (a) Tensile strength and flexibility.
- (b) Fineness and length of fibre.
- (c) Incombustibility and non-conductivity of heat and electricity.
- (d) Capacity for resisting the actions of acids, alkalies, and sea-water.

Amongst these there are factors apparently irreconcilable with everyday experience. For instance, we find in this naturally occurring material when highly fibrous a soft and silky texture, and yet the quality of being quite incombustible. This has constituted a great puzzle to many prospectors on first encountering this refractory mineral. In fact, the heartfelt sympathy of all will be extended readily to the weary men who, after a hard day's mining, received a rude shock on trying to boil the water for tea over an inviting but unburnable bunch of asbestos fibre.

The Romans, despite that they assumed it to be of vegetable origin, soon realized its fireproof qualities, and utilized it in the making of cremation cloths, as stated by Pliny. Because of its incombustibility it was also used in the making of lamp wicks, the lamps being used principally by the Vestal Virgins. The Roman

supplies came from the Italian Alps and from the Ural Mountains; they called it "amiantus" (from the Greek "unspotted" or "pure"). It is also of interest to remark that in the thirteenth century, when the indomitable Marco Polo was travelling through Siberia, then known as Tartary, some "amiantus" which resembled the Italian material was shown to him.



Veins of chrysotile in serpentine, Barraba, New South Wales.

[Photo.—G. C. Clutton.]

There is a good deal of misuse of the term "asbestos" (which being translated, means "unburnable"), and by virtue of this meaning many minerals can be identified as being "asbestiform" which are not at all fibrous. According to general usage, however, the term "asbestos" embraces those minerals which have developed a fibrous structure, and are incombustible. All these highly

fibrous minerals belong to either of two groups of silicate minerals, namely, the serpentine group and the amphibole group. Here again, if we are to adhere to strict mineralogical nomenclature, the term "asbestos" should be applied only to fibrous amphiboles, but, letting that pass, the word will be used to denote either varieties of these groups. The following are the most important asbestos minerals in order of abundance as far as the world's supply is concerned:

Serpentine group: *Chrysotile* (silica, magnesia, and a high percentage of water).

Amphibole group: *Amosite* (silica, iron oxide, and a low percentage of water).

Crocidolite (silica, iron oxide, soda, and a low percentage of water).

Chrysotile and crocidolite fibres, in nature, have an average length of three-quarters to a quarter of an inch, but with improved spinning methods a single thread hundreds of yards long may be produced. Amosite is exceptional in this respect, for the average fibre length is four to seven inches, while a maximum of eleven inches has been recorded. The specimen from the Transvaal shown in the photograph is therefore well above the average.

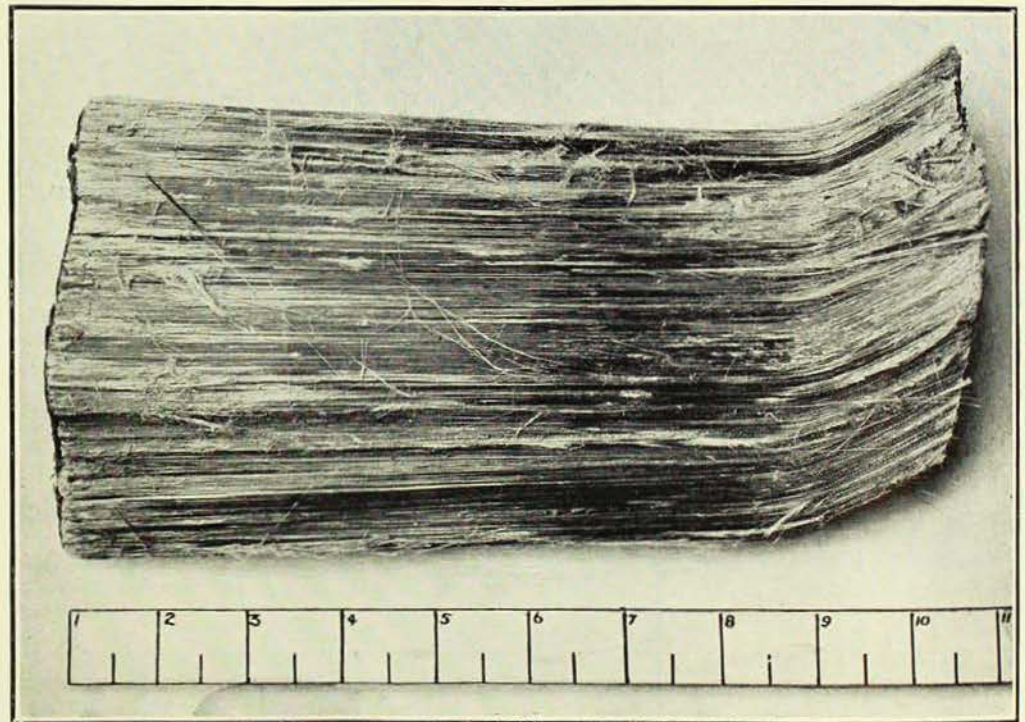
As regards flexibility and powers of resisting heat, chrysotile is superior to the amphibole varieties, but in all other properties crocidolite and amosite equal, if not surpass, the serpentine variety.

ORIGIN.

At this juncture a brief explanation of the origin or genesis of asbestos will be attempted, because the local conditions during the formation have contributed

largely to the existence of the peculiar fibrous property. It must not be thought, however, that all amphiboles, all serpentines, or even all asbestiform minerals exist solely in the fibrous form. Crocidolite, for instance, is often found quite massive. The fact that all these minerals, when fibrous, are found in veins in a rock, gives rise to the generally accepted theory that the influence of the adjacent vein walls is largely responsible for the cross-fibre structure; the expression "cross-fibre" means that the fibres are at right angles to the vein walls.

Chrysotile is found in serpentine, a rock of deep-seated origin that has been altered a great deal by the many stresses and strains imposed on it by earth movements. In addition serpentine has the same



Amosite, Lydneburg, South Africa.

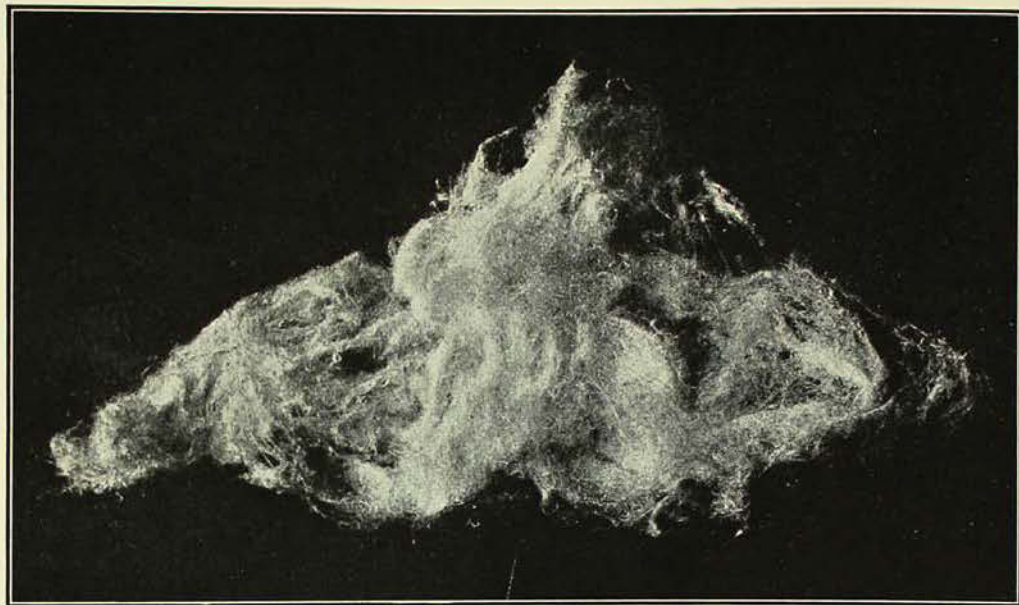
[Photo.—G. C. Clutton.]

chemical composition as chrysotile. Waters at high temperatures and great pressures penetrate the rock and dissolve portion of it. These solutions diffuse through the serpentine mass and in time cool sufficiently to enable crystallization to commence. The chrysotile crystals, by growing and exerting a great pressure by reason of their growing, actually force the serpentine apart and a vein is formed. This is constantly extending, both laterally

and longitudinally, because fresh chrysotile solutions are continually pouring through the walls of the vein, and adding new material. Thus the direction of growth is from side to side. With the added factors of cleavage and the resistance of the serpentine rock keeping the chrysotile compact, in the course of time, after complete cooling and solidification, we have an asbestos vein.

Cleavage in the particular case of the serpentine and amphibole minerals is the tendency they have, when struck, to break or cleave into pieces of a long columnar shape. In a similar manner mica can be peeled, as it were, sheet after sheet. This property is well known, and is its special form of cleavage.

Concluding with a brief reference to the amphiboles, it has been found that both commercial varieties occur in ironstones (which consist mainly of iron oxide and silica). Since these two compounds are also the main constituents of crocidolite and amosite, and since the minerals are considered to be filling pre-existing horizontal cracks in the ironstone, the genesis is probably explained when we suppose the ironstones to have been buried under younger sediments. With a reasonable amount of water vapour, a moderate rise in temperature, and an unlimited time of burial, the crocidolite and amosite form in the cracks, the material being derived from the ironstone. It is, in short, a molecular reorganization, which has been upheld by several synthetic laboratory processes. The cross-fibre structure in this case presents a complex problem, and, although the influence of the vein walls is undeniable, it is little understood. With the denudation of the overlying sediments, the ironstones are exposed, and at the present day the presence of the amphibole asbestos seams



Carded chrysotile.
[After Cirkel.]

in the lower parts of the ironstones shows that, where the higher temperatures were, there also has been the more extensive amphibole asbestos formation.

WORLD PRODUCTION.

The following are the countries which were the chief producers of asbestos during the year 1928:

Canada (seventy per cent. of the world's total).

Rhodesia (ten per cent. of the world's total).

Russia (seven per cent. of the world's total).

Union of South Africa (six per cent. of the world's total).

Then, in order of importance, came Cyprus, Italy, and the United States.

Canada produces only chrysotile, while Africa, although most noted for her crocidolite and amosite, also produces a good deal of chrysotile.

Although Australia is not included amongst the world's chief producers, chrysotile has a reasonably extensive occurrence in New South Wales, Western Australia, and Tasmania. Crocidolite has been mentioned as occurring in Western Australia, South Australia, and Tasmania. The total quantity produced in Australia up to the present day amounts to some 7,000 tons, having an approximate value of £100,000.

How really small this is, compared with the world's production, will be realized when it is mentioned that, in round figures, the amount for the year 1928 produced in the Union of South Africa, which only constitutes six per cent. of the world total, was 24,000 tons, with a value of £400,000.

USES AND APPLICATIONS.

In Russia, as early as 1760, a factory was established for the manufacture of asbestos goods, but the scheme was not at all successful. Until the year 1878 manufactured asbestos goods were few, owing to the difficulty of spinning the mineral, for the fibres do not possess sufficient tensile strength to enable them to be put through the same processes as fibres of animal or vegetable origin. At that time, too, the only known commercial variety was the Italian amphibole asbestos. From 1880 onwards, however, the steadily increasing quantities of Canadian asbestos and improved methods of treatment led to the processes of spinning, braiding, and weaving becoming very important. In 1906, commencing on a fresh venture, an Austrian applied asbestos in the manufacture of fireproof roofing and sheeting material, and in a remarkably short time this process proved immensely successful, factories being established in many countries.

In 1910, according to Canadian authorities, about sixty-five per cent. of the world's asbestos was being used in the manufacture of spun articles, such as steam gland

packing, asbestos cloth, as well as in the motor trade, and boiler coverings and allied articles. Other commodities in demand at this time were asbestos mill-board and asbestos rope and twine. As regards the above-mentioned fireproof sheeting industry, despite its having been in existence for four years in 1910, these Canadian authorities predicted that the time was not far distant when most of the asbestos fibre produced in the world would be used in the manufacture of roofing shingles and the like.

Since it transpires that more fibre is used in this than in any other asbestos industry at the present time, it may be of local interest to glance at a brief summary of the processes undergone by African amphibole asbestos at a Sydney factory.

The manufactured products, amongst other things, consist of sheeting (corrugated and flat) and various kinds of water piping.

In general, the two main constituents are the long amphibole asbestos fibres and Portland cement. Layer and layer of this cement with the fibres evenly distributed throughout are compressed together. The produced structure resembles reinforced concrete in principle and also in regard to toughness and strength, the asbestos fibres corresponding to the steel and the cement to the concrete. By virtue of its being fireproof and acid resisting, this asbestos cement is used a good deal as a building material.

Lectures on "Prehistoric Animals," by Dr. C. Anderson, and on "Achievements of Prehistoric Man," by Mr. W. W. Thorpe, were delivered in the Museum Lecture Hall to students of the Kindergarten Training College on February 26 and March 5.

On March 17 and 18, Mr. J. R. Kinghorn gave short addresses to parties of Girl Guides, explaining methods of observation in natural history.

* * * *

Among recent visitors to the Museum may be mentioned: Mr. G. Ivory, B.A.,

of the London School of Economics, returning from a trip to Polynesia; Mr. J. H. L. Waterhouse, from the Solomon Islands; Mr. E. W. P. Chinnery, Anthropologist, Mandated Territory of New Guinea; Mr. Jorma Pohjanpalo, Finnish Consulate; Dr. D. S. Davidson, University Museum, Philadelphia, who is making ethnological studies in Western and North Australia; Mr. P. D. Riddell, Principal of the Technical College, Newcastle.

Rock and Goose Barnacles

By W. BOARDMAN.

IT is interesting to note how animals living under like circumstances, contending with the same forces in the same environment, tend to follow structural lines remarkably similar, this though the animals themselves may belong to widely separated groups of the animal kingdom. The flattened bodies of various sluggish ground-feeders of the fish world, the graceful "built-for-speed" outlines of predatory surface feeders such as the barracouta and the porpoise, illustrate this principle. Such cases of analogous evolution are examples of what is called convergence. Another example less well known is furnished by the limpets and common coastal rock and acorn barnacles. The one is a mollusc, the other a relative of the crabs and crayfishes (but of that more later), both have a conical shelly shield over their bodies, the presence of which is regarded as the animals' "answer-back" to the main adversity of their surroundings. Both live exposed on the rocks of the surf zone and have to resist the same dominant menace—the great force of the waves—and a cone-shape serves best to deflect the flowing water so that no harm is done to the animal. The fact that the limpet may move at will and the barnacle is permanently attached is beside the point. With shape the resemblance between these two animals ceases, for there is no similarity in the method of, and mechanism for, obtaining food, and in the carrying out of the other life functions they have travelled along



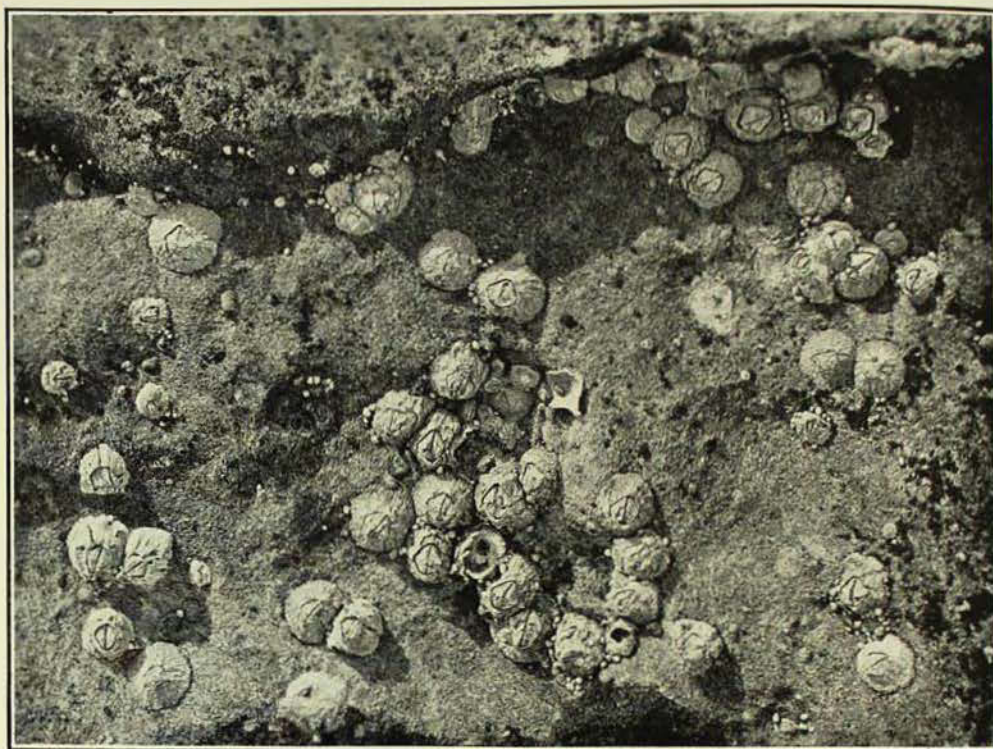
A barnacle-covered log washed ashore at Maroubra Bay near Sydney. In mediaeval times in Europe it was believed that geese hatched from these barnacles.

[Photo.—A. Musgrave.]

widely divergent tracks. Let us leave the limpet and take a closer look at the barnacles.

On the New South Wales coast, and indeed most of the world's shores, the barnacle is one of the commonest inhabitants and usually occupies a zone just above ordinary low water mark and perhaps extending upwards for some six feet. A very definite belt is thus formed on the rocky sections of the coast,

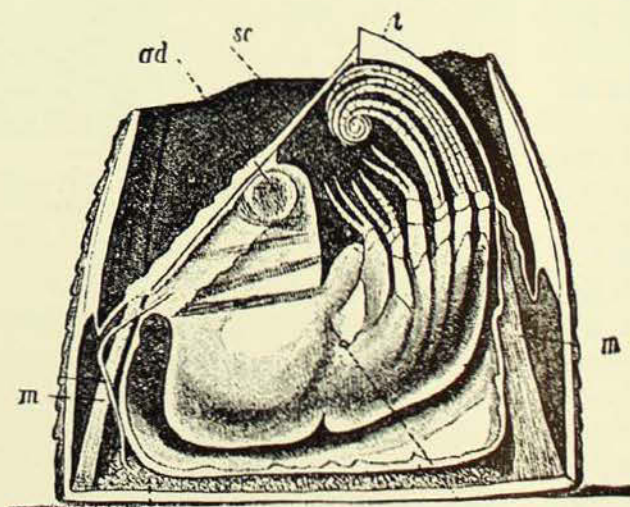
where the barnacles grow in thousands, often so numerous as in parts almost to obscure the rock on which they are growing. Each barnacle is in the form of a low cone about three-quarters of an inch or so across the base and about half an inch high; the cone has the point nipped off, the aperture so formed being the only entrance into the little fortress which guards the barnacle animal. The aperture is more often seen efficiently closed by two pairs of valves, which are controlled by muscles and may be opened at will. The main part of the shell is composed of wedge-shaped sections firmly joined together. During low water the barnacle zone becomes dry and exposed to the rays of the sun, and, so that the organism may survive these rhythmically recurring critical periods, the valvular doors remain tightly closed, hermetically sealing within sufficient moisture to prevent the animal from drying. Thus securely protected, the barnacles wait till the tide returns and inundates the rocks with water, when no time is lost in drawing aside the doors within the shell to permit the protrusion of a net-like structure somewhat like a clenched hand, the "fingers" as it were laced together by numerous lateral bristles. It is with a feeble clenching movement that the six double longitudinal jointed limbs which are really legs, are moved through the water, the bristles of neighbouring ones engaging. The whole arrangement acts as a perfect little casting-net for the capture of small marine organisms. If one or more of these microscopic sea mites should be so luckless as to come into contact with the bristles, a quick passage down the legs



Rock barnacles (*Tetraclita rosea*) which live attached to exposed surfaces on the local coast-line. In some parts they are so numerous as almost to obscure the rocks on which they are growing.

[Photo.—A. Musgrave.]

to the mouth at their base is ensured. Food is dealt with and masticated by a set of jaws and mouth appendages and then passed into the stomach, which has various digestive glands opening into it and terminates in an opening placed near the base of the outermost pair of limbs.



Anatomical section of a rock barnacle (*Balanus*) with the limbs withdrawn and the valves closed. *t* and *sc* the valves, *m* and *ad* muscles controlling the valves.

[From Lang's "Comparative Anatomy."]

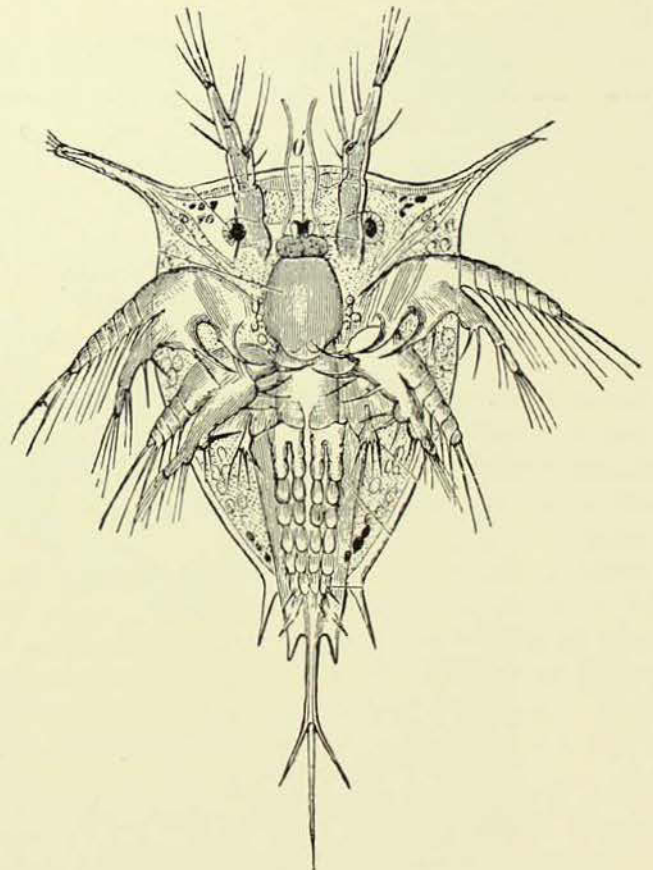
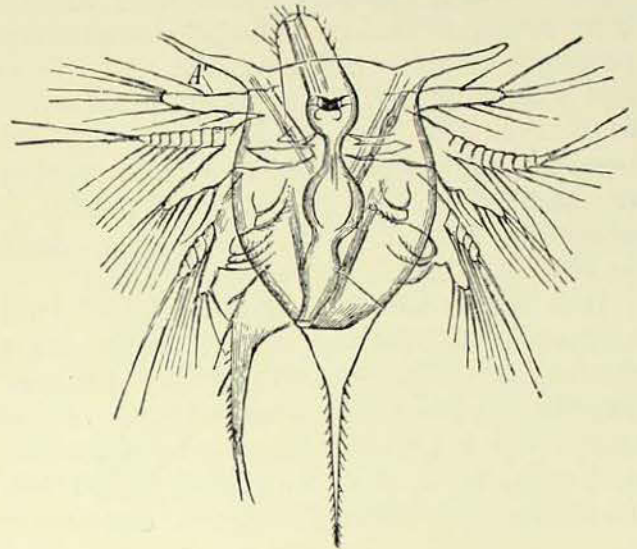
The main body is small and bag-like and is enclosed within an investing fold of the flesh called the mantle, between which and the body proper is a cavity. The whole is contained within the shell, and there is a slit in the mantle through which the legs are protruded.

A blood system of a very primitive order is present, there being no heart or well-developed series of blood vessels; a pair of branchiæ or gills serves as respiratory organs. The nervous system is a little more elaborate and definite, but also of a decidedly primitive order.

Most barnacles are hermaphrodite, that is to say, male and female generative organs occur in the same individual. The eggs are extruded into the mantle cavity, which serves as a brood pouch, and in this position development proceeds to the liberation of a free-swimming embryo, which, bursting its way out of the egg casing and being provided with swimming appendages, makes its way from the parental fold and commences to fend for itself.

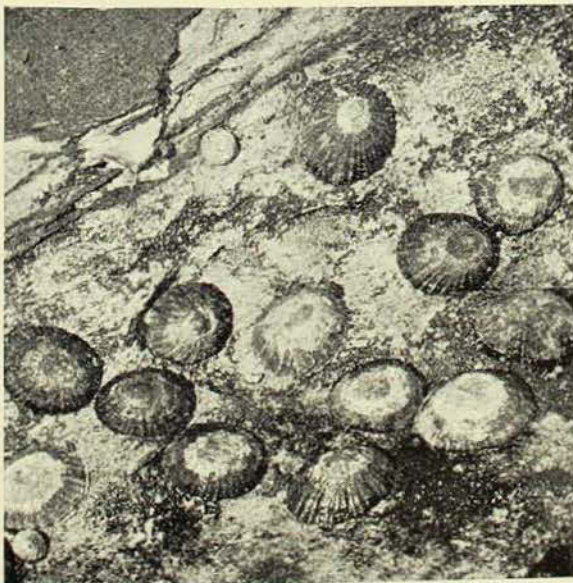
The barnacle larva is very unlike the parent it has just left and which it will ultimately resemble. This tiny jewel has a body bearing in front a pair of conspicuous horns, and from various points there spring spiny processes. There

are also six double legs plentifully bewhiskered with fine hairs. A tiny larval eye and the commencement of a primitive brain are also present. Undoubtedly, limited locomotion is provided by the movement of the legs, but wind and tide seem to be the main factors in dispersing the larvæ. The elaborately spined nature of the body is specially designed to give it buoyancy;



Two stages in the development of a barnacle (*Balanus*). The three pairs of double limbs bewhiskered with fine hairs are very evident.

[From Claus's "Textbook of Zoology."



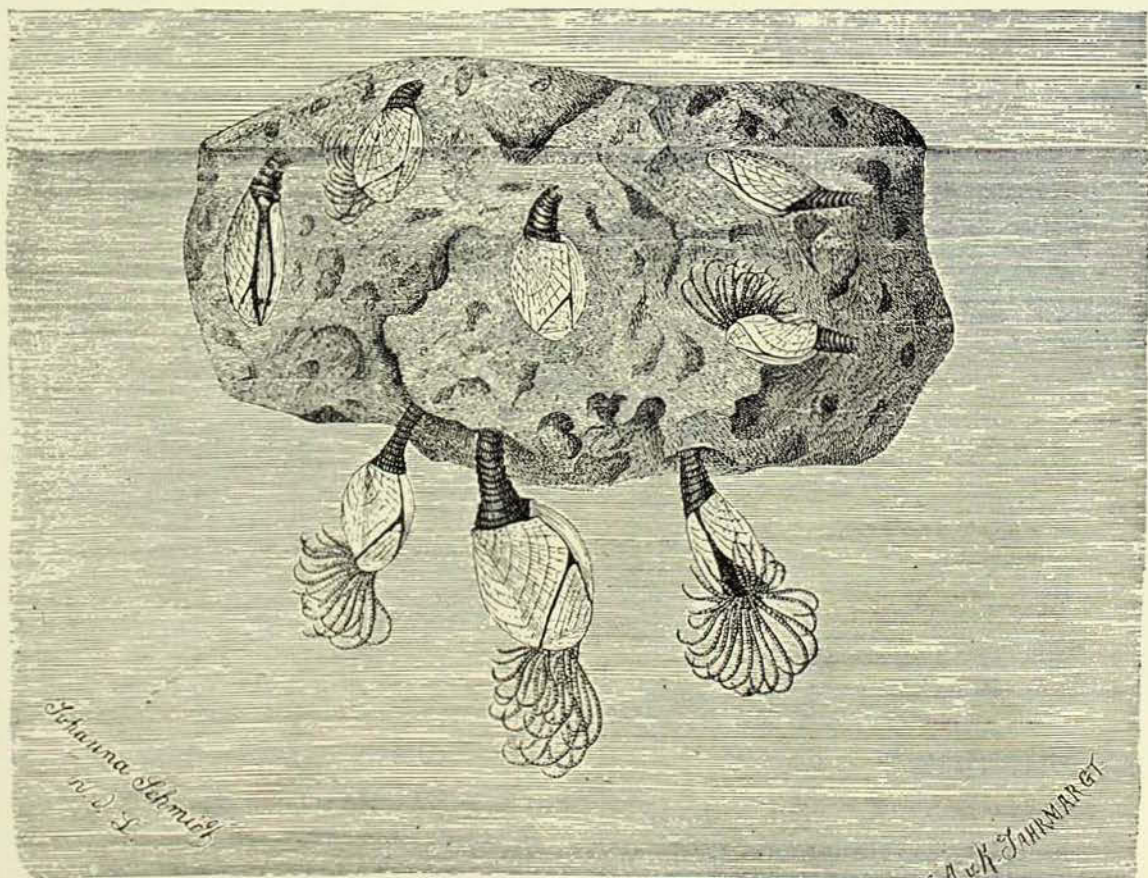
Limpets (*Cellana variegata*). Though widely separated in the animal kingdom, rock barnacles and limpets have converged to a similar conical shape, the better to withstand the waves to which they are continually subjected.

[Photo.—A. Musgrave.]

this is a modification present in a great number of the minute forms of life, some adult, some, like the barnacle, merely larval stages, which go to make up the enormous floating population of the surface waters of the sea. After a brief spell of roving, a series of moults commences, and from the first larval stage a characteristic and entirely different larva is borne. This is known as the *Cypris* stage, during which the animal is an active swimmer. The little wanderer, however, is now reaching the end of its free existence and soon becomes attached to a rock by the head end, a cement secreted by special cement glands serving to anchor it till the conical shell is gradually formed and the final changes to the adult state undergone.

It is a singular and significant fact that animals attached in their adult state should exhibit free-swimming larval stages. Singular in that the phenomenon occurs universally in the sea's attached population, such as sponges, corals and other zoophytes, barnacles and a dozen others, significant

by virtue of the operation of the Biogenetic Law. The word biogenetic comes from two Greek words meaning life and commencement, and is applied to the "law," which may be stated thus, "That in the course of its development an animal climbs its own family tree." The idea is that the various changes which the animal has undergone in the course of its evolution, though now obsolete, have left their impress as more or less distinct vestiges in the development. Modification in habit and structure have often rendered the record incomplete, sometimes practically wiped it out, but nevertheless there are stages in the life history of many animals which it seems feasible to suggest are reminiscent of stages through which the animal has at one time passed. Of course this view is a real source of contention in the scientific world and has not by any means been accorded universal acceptance; incidentally, it is one of the mainstays of the evolutionary doctrine. Reverting to the case of the barnacle under



A sketch of goose barnacles on a floating piece of wood, showing the "casting-net" arrangement of limbs protruded.

[From Brehm's "Thierleben."]

discussion, the *Cypris* stage presents a remarkable likeness to a small swimming crustacean, one of the water fleas called *Cypris*. The similarity between the two is so striking that we have little hesitation in assuming that somewhere lower on the family tree of the barnacle there was an ancestor built on such lines. Previous to the working out of their development story, the barnacles were classified with the molluscs on account of their shell-like structure, but immediately their crab affinities were perceived they were placed in their present position. Barnacles then are really crabs doomed to a sedentary existence, and consequently modified by it. To quote Huxley, "A Barnacle may be said to be a Crustacean fixed by its head, and kicking the food into its mouth with its legs."

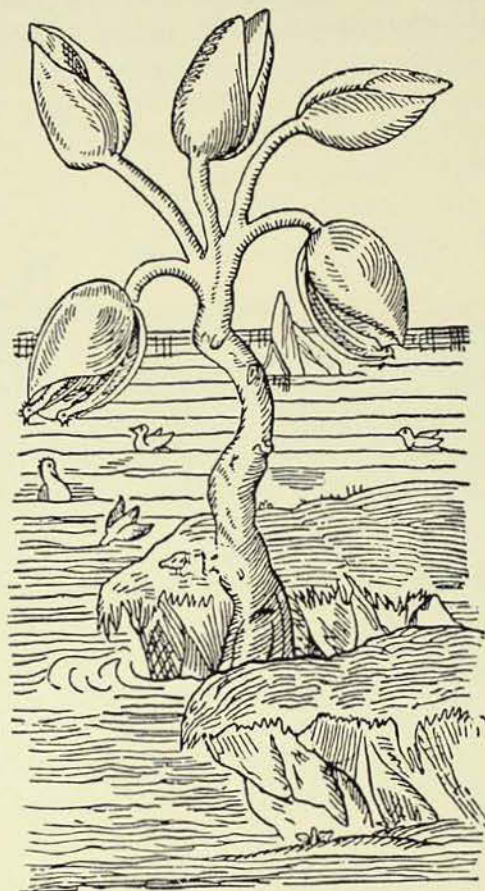
GOOSE BARNACLES.

Floating debris of all kinds, logs, coconuts, cuttle bones, and the like, when washed ashore, usually during heavy weather, are often found to have growing on them a peculiar stalked structure known as a goose barnacle.

The goose barnacle's body is enclosed in a flattened, somewhat arrowhead-shaped casing, made up of shelly plates delicately tinted blue. The whole depends from a fairly tough and solid brownish stalk, which may be a foot or even more in length and is very contractile. From a slit along one edge of the shell the "casting-net" arrangement of limbs may be protruded at will, its structure and action being essentially the same as in the rock barnacle. The various systems and the general anatomical arrangement are also similar to those of the rock barnacle. The shelly armour presents one of the main differences, the plates being thinner and adapted to protect the animal within, hanging as it does at the end of a stalk.

During mediaeval times a curious legend developed round these barnacles and a migratory Arctic bird known as the Barnacle Goose. This legend, which persisted from the twelfth century till as late as the seventeenth, was to the effect that the Barnacle Goose hatched from the barnacles washed up on the sea-

shore. With great solemnity learned men of the time wrote about and figured the occurrence (varying in details), and in the year 1678 a paper by Sir Robert Moray, read before the Royal Society, describes what he determined as little birds enclosed



A fanciful illustration from Gerard's "Herball" in support of the widespread belief that barnacles gave birth to the geese which periodically visit the shores of the British Isles.

in barnacles. The barnacles written about in this case were washed ashore on the coast of Scotland, and the following is an extract from what he says about it: "The little Bill like that of a Goose, the Eyes marked, the Head, Neck, Breast, Wings, Tail, and Feet formed, the Feathers everywhere perfectly shaped and blackish coloured, and the Feet like those of other Water-fowl, to my best remembrance."

The story probably originated with the observation that the Barnacle Goose and the logs and tree trunks covered with barnacles arrive simultaneously on the eastern coast of England and Scotland, the birds moving south from their Arctic

home round about Spitzbergen and the driftwood forced ashore by the autumnal gales. A fertile imagination plus indifferent observation might produce an illusion that the barnacle animal bore a resemblance to a bird, but already in this period the seeds of accurate observation and careful experiment were being planted.

An interesting sidelight on the barnacle myth is provided by a quaint complaint of Giraldus that the Irish clergy were guilty of eating the flesh of Barnacle Geese during their fasting periods on the plea that the birds were not flesh, but, having been born of fish living in the sea, could legitimately be eaten.

Book Review

A YEAR ON THE GREAT BARRIER REEF.
By C. M. Yonge, D.Sc., Ph.D. (Edin.).
Putnam, London and New York.
1930. Price: 26s. (Sydney: Angus
& Robertson, Ltd.)

This important and fascinating work is a thoroughly scientific yet not severely technical account of the activities of the Great Barrier Reef Expedition, of which Dr. Yonge was the leader and which spent a little over a year on Low Isles, near Port Douglas, investigating the many problems, biological, geographical, and economic, of this celebrated natural feature.¹

The author commences with a historical sketch and an outline of the various hypotheses which have been advanced to explain the formation of coral reefs in general and of atolls in particular, keeping in mind the fact that reef-building corals can grow and flourish only in comparatively shallow water. Dr. Yonge ventures the suggestion that the Darwin-Dana subsidence theory holds for barrier reefs, but for atolls he regards the views of Murray, which involve a raising of the sea bottom, as nearer the truth. Then follows an interesting and readable account of the life-history of the coral polyp, and a description of the different kinds of reef-building corals, and of other inhabitants of the reef, worms, molluscs,

echinoderms, and fishes. An important chapter deals with experimental work on corals, their breeding, growth, and respiration, a subject which will doubtless be treated at much greater length in the detailed account of the scientific work of the expedition which is being published by the Trustees of the British Museum. Chapter IX, "On the Sea," is of absorbing interest in its description of the methods of investigation into the temperature, salinity, and other properties of sea water and of the collecting and sorting of the planktonic (drifting) life, animal and vegetable. One interesting result is the discovery that the plankton does not vary greatly in abundance throughout the year, contrary to what is found to be the case in colder latitudes, where there is a great resurgence of planktonic life in the spring.

Economic matters were not neglected, and the work contains descriptions of the pearling, Trochus-shell and bêche-de-mer industries, as well as the sardine and dugong fisheries of Murray Island and the turtle-canning factory at Heron Island.

The work, which is well written and produced, contains a large number of photographs. One may, however, call attention to the typographical error on page 190 which might lead the reader to suppose that the stone fish-traps of Mer are intended for the capture of the dreaded stonefish to which every one gives a wide berth.

C. A.

¹ The inception of the Expedition has already been alluded to in this MAGAZINE (Vol. III, p. 219), and Messrs. G. P. Whitley and W. Boardman, two of the five members of the Museum staff who spent some time with the Expedition, have described their experiences (*loc. cit.*, Vol. III, pp. 313, 330, 366).

Wild Life on Inland Waters

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

MY cruise through Barmah Lakes and their creeks and channels, in nesting time, was a voyage of "crowded solitude." Parallel with the Murray, which separates it from Moira Lakes, this Victorian wonderland of waters stretches for nearly forty miles from Barmah, varying in width from a mile

a car may now be driven, with care to dodge trees and stumps and skirt oozy depressions. To almost any part of the water birds' territory, it is possible to go afoot towards the end of the season. But the time for a visit is when the lakes are full and highways and byways



Game Inspector with confiscated drum net, the use of which is forbidden in Victorian waters.

[Photo.—Chas. Barrett.]

or so to ten miles. In midsummer the water is receding, and long before autumn the lakes may be plains and the creeks only chains of muddy pools, while dust and withered aquatic plants alone are in the channels.

Where, in December, I waded to see night-herons and egrets in their rookeries,

are through water; when, without a guide, it would be easy to get bushed in Barmah Lakeland.

This has been a bountiful season of rains, and swamps and lakes on either side of the Murray spread their overflow for miles. A splendid season, too, for

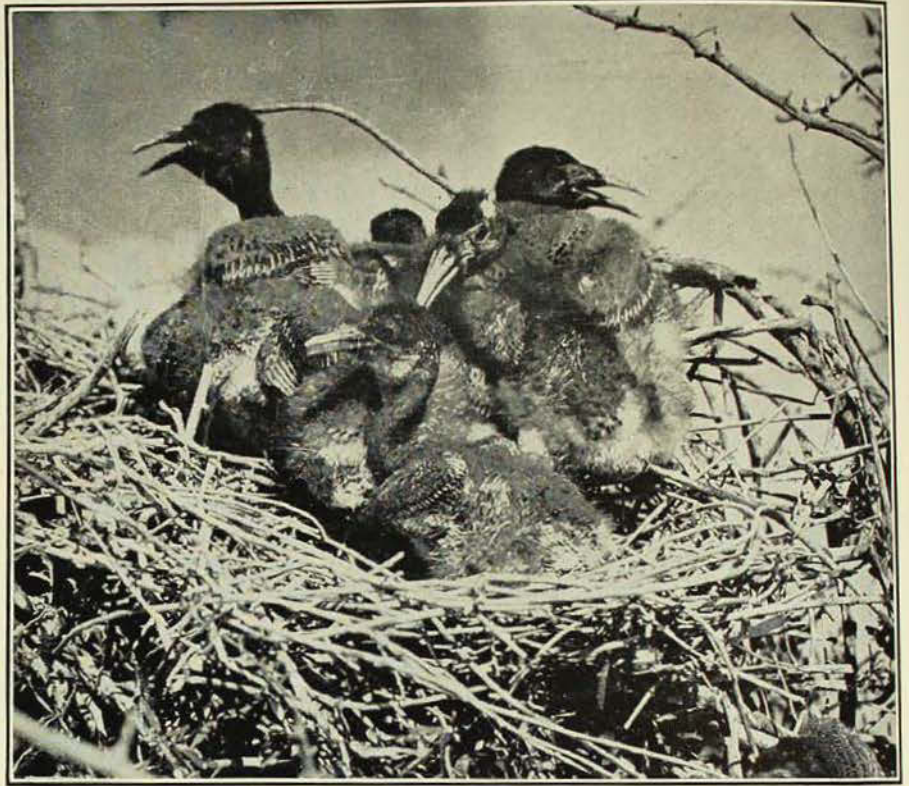
ibises, ducks, coots and herons. I have not before seen so many birds congregated in one district. There were more than a million, we estimated, from a section-count in the ibis rookery and observations made during short and long cruises in a flattie. The great majority consisted of ibises, the straw-necked species (*Threskiornis spinicollis*), with a sprinkling of the white ibis (*T. molucca*), which had also one or two small isolated colonies.

Next to ibises, marsh terns (*Chlidonias leucopareia*) were most numerous, though, compared with the host of "sickle-bills," they seemed but a few stray birds. Yet there were several thousands of the whiskered *Chlidonias*, their realm the lake, golden with lily blossoms or green with floating moira-grass.

We found scores of nests, frail rafts made of lily and grass stems on a foundation of broader stems and leaves.

To reach the ibis rookery we poled the flattie for ten miles from the river at Barmah. Reedy Lake is a resort of duck shooters in the open season, I believe, and they approach it by land from the east. We came from the west, all the distance by water, and, in the flattie, circumnavigated and traversed the Birdland Venice. A city in the waters, with isles of rushes, of which the "houses" were made. Tens of thousands of nests formed the capital, which spread on every side into crowded suburbs. No evidence of town planning; indeed, there were slums in this city; and, but for the clean wind that blew over it and the freshness of water covered with plants, a long stay would have been unhealthy.

Every clump of rushes held ibis nests. Competition for sites had been keen; and the tenants of many nurseries, in a fright, became mingled. We were there at hatching time for thousands of clutches; while numbers of nests



Young Ibises: two broods in one nest. Chicks from a lower nest have climbed into the top one.

[Photo.—Chas. Barrett.]

already contained weak, sprawling ibis babies.

The ibis is the farmer's friend, the "policeman of the paddocks," and, with a plague of grasshoppers advancing from Riverina, Victoria had need of these birds in December. Millions of "hoppers" daily must have been taken from farm- and grasslands by the ibises of Barmah Lakes, whose capital now is one of empty cradles.

No gunshot broke the silence of that lonely place while we were there, recording with note-books and cameras. Silence? There was none to shatter, for, night and day, bird voices sounded, and when the birds rose at our urging the noise of their wings was like wind in the trees or the swishing of rain on ripe wheat. In camp, half a mile away, where mosquitoes kept us wakeful, we heard the murmur of the rookery. Mosquitoes are the bane of all these inland waters—mosquitoes and snakes, with leeches added when you go wading, barelegged, among the floating lilies.

Leeches, by the way, provide a fair livelihood for a few riverside men. At

wholesale rates, for the hospitals, medicinal leeches are worth 30s. a thousand; and one old leech-gatherer told us that often he captured a thousand a day. Wading in still water, he stirred up the mud, flopped a wide board on the surface and scraped from its underside the catch. Leeches, disturbed from the mud, rose and attached themselves to the board. Others fastened on to the gatherer's bare legs, from which he took them nonchalantly. We brushed them from our more tender limbs, with expressions of disgust. But one may become used to anything, and after a few days in Lakeland leeches are accepted, with mosquitoes and snakes, as part of the game.

Barmah Lakes are famous among snake charmers. Noted serpent-catchers have operated in this locality; one captured nearly seventy tiger snakes during a foray. It is said that nearly a thousand snakes of this dreaded species have been taken from the whole area. "Do you wonder," our guide asked, rather sadly, "that 'tigers' are becoming rare?" We tried to look regretful, and dismally failed. Our quarry being birds, we could be content without snakes, particularly as the programme included a camp-out in the heart of Lakeland.

We saw few snakes; but, discounting the yarns that riversiders love to spin around the camp fire, are willing to believe that tiger snakes abound in this flooded area. It is wise to be wary. Even our guide, when we were on dry land, glanced down occasionally. He killed five "tigers" in one spot last summer. But he declared that, in his long experience, no kind of snake was really aggressive. I fancy there are exceptions, though the black snake is almost good-natured if left alone. I would not trust a brown snake, nor a tiger.

Australian coots (*Fulica atra*) were plentiful among the flooded gum trees.



Nest of the Marsh Tern.

[Photo.—Chas. Barrett.]

As the flattie nosed her way through aisles, bumping here and there a submerged log, or meeting resistance among matted water-lilies, she put the alert little birds to flight. They slipped from their nests, to go pattering across the water. Some pairs had their homes in "caves," the hollowed butts of old trees; some in heaps of *débris*; others in low hollow stumps. We lost count of coots' nests, but kept a tally of the swans'; the latter were much less numerous. One swans' nest, on the edge of the ibis rookery, was beautifully made, a perfect little island-home. Others indicated only average skill in home-building. There surely are degrees of craftsmanship among birds. Even in the ibis rookery we noted nests more neatly made than any of the hundreds round about them. In the open, five nests—no more—were built up, cone-shape, as carefully as if the builders had all worked to one plan. They reminded me of flamingoes' nests—seen on an African lake—only they were constructed of aquatic plants mainly, while the flamingo is a mason, using clay or mud.

Out in the open, where acres of those golden lilies, fringed like the violet *Thysanotus* of the land, are splendid in the sun, we cruised for hours. Our quest

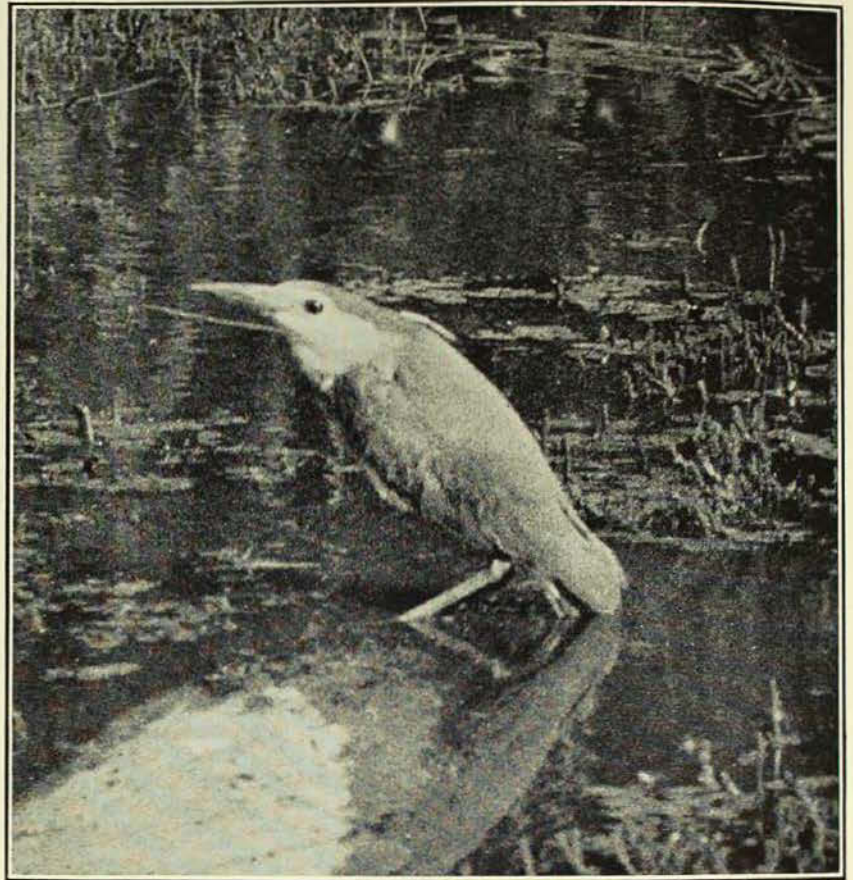
was for nests of grebes and whiskered terns. Hardly a search, since the terns were nesting everywhere on one of the big lakes, and grebes, both the tippet or great crested species (*Podiceps cristatus*) and the black-throated grebe or dabchick (*P. ruficollis*), were often their next-door neighbours. Close together were four terns' nests, two of the crested grebe, and a dabchick's nursery. But terns were far more numerous, and bold or confiding, than the watchful diving birds.

In few cases were the eggs covered in water-weeds, when the owners left home for awhile. It is usual for grebes to conceal their clutches, before quitting the nest; these Lakeland birds perhaps were lazy, or we allowed them no time for camouflage. Their nests were compact or carelessly made; the tippet grebes' showing more art than those of the lively and charming little dabchicks, birds that have something of Puck about them.

The terns' eggs were notable for colour variation. Happily, there was no collector in our party, else many nests would have been robbed. The clutches were so tempting! Three eggs formed the usual complement, but there were plenty of quartettes. One clutch was so beautiful, the eggs having a rich blue-green ground, with dark sepia and umber markings, that we longed to photograph it in natural colours. The fringed yellow lilies were a foil to the gem-like eggs in their floating casket.

Among the moira-grass and the lilies on that lake—judging by the birds that, with shrill cries, flew over it or were resting on the plants—there were five hundred tern nests at least; possibly twice that number.

Through field glasses we watched the crested grebes, swimming with easy grace and diving without leaving a bubble to show where they disappeared. They would not allow a near approach. Coming



Unique photograph of Nankeen Night-heron "at home."

[Photo.—Chas. Barrett.]

down a creek, we surprised a darter (*Anhinga novæ-hollandiæ*), or snake-bird; the guide termed it "water-turkey," an American nickname for this strange, unsociable bird. It is classed among the master divers, but goes under like a submarine; it submerges when swimming low in the water with only head and neck in view. How does it maintain this position, instead of "swimming afloat"?

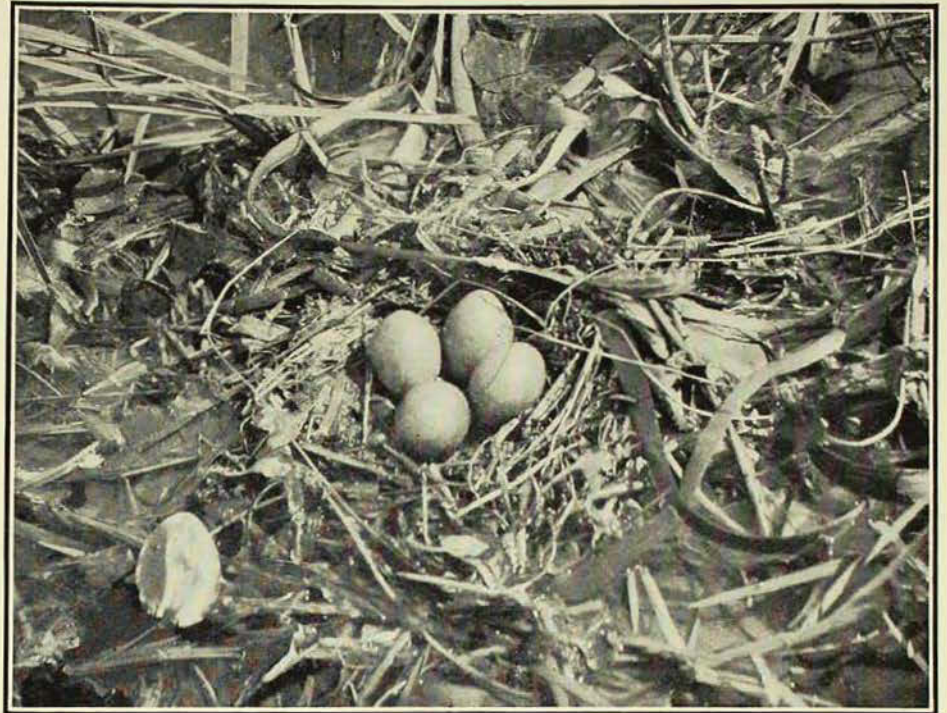
Cormorants have big rookeries in Barmah Lakeland; and, despite organized persecution, due to anglers' jealousy and hatred, the birds are not decreasing. Their eggs are smashed in hundreds; young birds are shot in the rookery by the members of cormorant clubs and others. The same trees, year after year, support hundreds of nests, and the dusky and pied clans of fish-eaters continue to flourish.

I hold a brief for cormorants. They are not so black as they are painted by the angler. Nobody denies that they eat fish and are eager for all they can get.

They pay for their meals ; a fact the angler overlooks or declines to believe. Cormorants prey upon yabbies, which are very destructive to irrigation channels, as they burrow into the banks. Cormorants have also a liking for crabs, enemies of fish ova. That is evidence for the defence. In some localities poachers do more than cormorants to spoil sport for the angler.

Pelicans frequent Barmah Lakes, but do not nest there. We saw large flocks of the great birds, cruising serenely, out of camera range. Ducks of several species were numerous ; most engaging with their broods, which scattered at the parents' warning, to dive and rise well hidden, with only the bill above water, among the lily leaves.

Tortoises are tenants of these waters. They go ashore to dig burrows in which the eggs are deposited, covered over, and left. Nests were found over twenty yards from the waterside. Some were empty ; they had already been discovered



Nest of the Dabchick.

[Photo.—Chas. Barrett.]

by a monitor lizard, or some other animal with a taste for tortoise eggs.

Barmah Lakeland holds a big rookery of night-herons (*Nycticorax caledonicus*), those curious and beautiful birds with long white nuchal plumes, that are hunch-backed when dozing in the treetops, and furtive shapes when fishing for yabbies and frogs. One we surprised early in the morning. He was perched at the end of a log, and walked off to wade away, almost casually, as the flattie approached. He had eaten too well, or been struck by a hawk, and escaped with slight injury. We secured a moving picture of that heron, probably the first of its kind that has ever been filmed.

Near the night-herons' haunt is Barmah's egret rookery, known to few people. It is not easily found, and, happily, is well guarded against raiders. A sharp-eyed, very active honorary game



Nest of the Bittern.

[Photo.—Chas. Barrett.]

inspector does the rounds of Lakeland. He guided me to the egrets' rookery—a wading trip through snake-infested spots. A slimy stick glancing against one's bare leg was just a trifle unpleasant. "It's a rare place for 'tigers'," I was told. But when we arrived among the egrets, snakes went right out of mind. A glorious picture of wild life at home was framed there, by foliage and the cloudless sky. Egrets on their nests, high above us; egrets perched on swaying topmost boughs; still more snowy plumaged birds looking at us from below; they had paused in their search for water-beetles, little fishes, and other creatures that egrets eat.

The tragedy of a raid may never make this rookery desolate, but, years ago, on the New South Wales side of the Murray, plume hunters took their hateful toll. They shot birds on the nest, and left hundreds of baby egrets to die miserably of starvation. The white aigrette that some women wear is dyed red, a badge of cruelty and of shame.

At sunrise, it was the pleasantest thing

in the world to go quietly from camp to the water's edge—and win a glimpse of Fairyland. White egrets, suspicious but too intent on their hunting to leave, were so near that, through the glass, one could follow the expression of their emotions, see the light in their eyes, and admire the colour-tones of their beautiful orange bills. No other bird gives to its surroundings this touch of unreality, makes for us a dreamland of such familiar things as ancient red-gums, rising grey in the dawn from water so still that it mirrors trees and sky, and the birds.

A note in harmony with the scene—its unrealness—may come from the nearest reed bed: the booming call of a bittern. The "bunyip-bird" lives in these parts, and nests among the rushes and the reeds. It is a nest difficult to find; the owner's voice is no aid to location of either nest or bird, for the bittern is somewhat of a ventriloquist. Only once have I found a nest, and rarely have seen the bittern in its haunts, though the echoing, bull-roar boom to me is a familiar sound.

Mr. E. Le G. Troughton, Mammalogist, returned to duty on February 26, after twelve months' absence on long service leave, during which he visited the leading Museums of Europe and America. Mr. Troughton made copious notes on the Australian material housed in overseas museums and on methods of storage, display, and research. These will be embodied in a report, which is now in course of preparation.

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In commemoration of the circumnavigation of the globe by the Danish exploring vessel *Dana*, Dr. Johannes Schmidt, who was in charge of the Expedition, had a medal struck and expressed the desire that a copy be transmitted to the Australian Museum as one of the institutions that showed interest in, or gave assistance to the Expedition. The medal is of bronze, with a figure of the *Dana* on the obverse

and on the reverse a map of the globe, showing the route followed by the vessel. The medal is a very acceptable gift, and a valuable memento of pleasant associations with Dr. Schmidt and the members of his staff.

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In October, 1929, a False Killer Whale (*Pseudorca crassidens*) was stranded at Bulli and buried in the sand of the beach. On February 18 last, a Museum party consisting of Dr. C. Anderson and Messrs. G. C. Clutton and J. Kingsley, accompanied by Mr. E. C. Ballek, proceeded to Bulli and exhumed the whale. It was hoped to find the body completely skeletonized, but even after sixteen months a considerable amount of integument was still adhering to the bones. All the bones were successfully recovered, and the Museum now possesses two examples of the skeleton of this rare and interesting animal, which was for some time believed to be extinct.