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Festive Scene in a Papuan Village. The dubu, or club-house, is elaborately decorated for the great occasion; from it are strung festoons of yams and sweet potatoes to the tops of neighbouring houses. Young maidens have ranged themselves on the dubu, and the married women stand beneath them in readiness for the ceremonial dance. Their skirts of stranded leaves and grasses swish to and fro as they swing their hips; they wear feather head-dresses and valuable ornaments of polished shells.

[Photo.—*A. C. English.*

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Feast and Ceremonial in Native Life

By Elsie Bramell, B.A., Dip.Ed.

TOURIST steamers in recent months have conveyed many holidaymakers to the shores of New Guinea and have given them an opportunity of seeing something of the native life there. Visitors who have ventured further inland have sometimes been fortunate enough to witness a village festival, and the spectacle has caused the more thoughtful of them not merely to marvel at the sight presented to their eyes, but also to wonder as to what significance these feasts hold for native society. They have noticed that even the nonchalance of the invading white settler has not dampened the ardour of the native for his festive gatherings, and, though certain elements have of necessity been altered or abandoned, for example, the preliminary hunting of human heads, it is with a faithful regard for traditional procedure that the ceremonial is conducted. European interference has resulted in the decay of ceremonial feasts in some areas, and the question is whether this decline has any harmful effects upon the well-being of the natives, or put in a positive form, whether feasting as an institution contributes to the welfare of native society. History has shown us that no institution comes into being unless some need for it has been felt; this is equally true of feasting, and it has by no means outgrown its use.

By feasting we do not mean the mere consumption of food. Much more than that is implied in the term, for it includes the ceremonial and ritual interspersed between the actual eating, and the songs and dances that occur in between the various ceremonies.

We shall select for our survey varying types of feasts that occur in Papua. Their size varies from the small family gatherings upon the birth of a child, or the marriage festival that brings two families together, to the elaborate Big Feast of the Mafulu which is attended by every able-bodied man, woman and child of, maybe, twenty villages.

Any red-letter day in the life of an individual is taken by him or his relatives as sufficient pretext for a celebration;

Scene in Gabuoni village (South-East Division, Papua) prior to a festival. Weeks before the feast bunches of bananas, taro and yams are hung upon poles lining the street in order to impress visitors with the wealth of the village, and to give them an indication of the splendour of the feast to come.

[Photo.—*Capt. Frank Hurley.*

such minor festivities help to vary village life, which without them would be drab and monotonous. Occasions chosen for feasting may be the assumption by a boy or girl of adult garb, the initiation of boys, a marriage or a death. The marriage ceremonies of the Roro and Mekeo take an interesting form—that of mock "marriage by capture". The girl is borne off by the man's relatives while her mother stands by impotently shrieking curses at them. The girl's clansmen put up a noisy fight for her defence, but it always happens that her captors get away. The bridegroom's house is then raided for the bride indemnity. When the excitement subsides a quiet ceremony is performed. It is not until one month to one year afterwards that the two families further strengthen the tie between them by eating together in ceremonial fashion. These minor festivals are of common occurrence. Since they are attended by the relatives and clansmen of the central figure, one of their most important functions is the strengthening of kinship bonds—by no means a negligible factor in a primitive community, the very existence of which depends upon its degree of social cohesion. Again, the frequency of these festivities quickens the pulse beat of economic life, for they necessitate a continual supply of ready food. This means that village gardens must always be kept in good order and planted at the correct times so that there will be no lack of yams when they are wanted.

FUNERAL FEASTS.

Of all these crises in life only the event of a death necessitates really elaborate ceremonial; at no other time is a man required to modify his behaviour to so marked a degree. Among the Koita, as soon as a man dies the news is spread to neighbouring villages. His relatives come at once to his house and surround the body, which is placed, dressed and decorated, upon the "bisa" or death-chair. A solemn vigil is kept beside the corpse

Group of Hanuabada men (Port Moresby) decorated for the dance. They wear brightly coloured feather head-dresses, which bob about fantastically as they shuffle along. Armlets of polished shell adorn two men; one has a boar's tusk suspended round his neck; his companion at the other end has donned a necklace of dogs' teeth. The men beat the measure of the dance by rhythmically tapping the drums, one end of which is covered with lizard-skin.

[Photo.—*Capt. Frank Hurley.*

throughout the night, the silence being broken now and then by fitful wailing and the singing of dirges.

Next morning, all the dead man's possessions are broken and tied in a bundle, except his most valuable ornaments, which are preserved for his heirs. The body, stripped of its trappings, is wrapped in a new mat and borne off to the grave. The funeral obsequies include three important feasts, the Bowa, Venedairi and Ita. At the Bowa feast the clansmen and friends of the dead man collect food and partake of it before his house. On the fourth day after the funeral comes the more important Venedairi feast, the chief function of which is to place the widow or nearest relative into full mourning. Again clansmen collect and distribute food; the widow is blackened from head to foot by the wife of the dead man's brother and her head is shaved. She wears a pendant weighted down with fragments of her husband's personal property, also two netted vests ornamented with shells and feathers and a petticoat which is made with long straggling strips of grass. For six months the widow wears these mourning garments and seldom shows herself in public. She and all other relatives abstain from those kinds of food which were particularly relished by the dead man.

Funeral feasts from their very nature cast a solemn hush over the village; loud talk or boisterous laughter are not seemly at this time. When a chief dies, everyone is expected to conduct himself sorrowfully even if he does not assume full mourning. However, this kind of thing cannot last indefinitely. The elders know that it is not a normal or healthy condition for a community to be in, so, when six months have passed by, they make the relatives take the same sane outlook as themselves by stripping them of their mourning. At the Ita feast food is brought into the village and piled in heaps, and at the

proper moment is distributed to the clansmen. The important ceremony for the removal of mourning from the widow then takes place.

These funeral feasts, which may seem to us unnecessarily protracted, are in truth of great value to native society, for they are the means whereby harmony is restored to a community after a period of uneasiness and unrest. This emotional disturbance is the invariable result of a death in the village, and it is all the greater if sorcery is suspected as the cause of death. The natives believe that the first thing to do is to see that the ghost of the deceased is properly ushered forth on its journey from the land of the living. Great care is taken that nothing will occur which may antagonize the spirit of the dead man against the community. For the ghosts of the dead wander abroad, they may be either benevolent or malicious, and have power to bring good or evil fortune to earthly folk. Therefore, the natives seek and ensure their goodwill by compelling all clansmen to follow out such mourning rites as have been described.

BIG FEAST OF THE MAFULU.

Williamson suggests that the original reason for the holding of the Big Feast by the Mafulu was the propitiation of the ghosts of dead clansmen. However, far more real and socially valuable functions may also be attributed to it. An entire community, consisting of two to eight villages, makes preparation for the feast, to which one other community is invited. Preparations for a celebration on so large a scale have to be begun at least one or two years before the proposed date. Fresh areas of bush have to be cleared and planted with sugar cane, tobacco, sweet potatoes, yams, and taro. Bananas are plentiful enough, but the breeding of pigs has to be entered upon seriously. The chosen club house has to be repaired or a new one built. New houses are constructed for the accommodation of guests, view platforms 12 to 20 feet high and supports for the display of food are erected.

One month before the day formal invitations are sent to the chosen community. Strangely enough the exact date depends on the guests. As soon as it is known that they are on their way, the host community hastens to garnish specially prepared poles with sugar cane, bananas, yams and taro; below the vegetables are tied human bones and skulls, and sheaves of croton leaves. At least sixteen different ceremonies are performed. Dancing goes on each night and splendid head ornaments are worn by the dancers; they are huge erections six to twelve feet high and made of row upon row of brightly coloured feathers attached to wooden frames. Such ceremonies as are conducted upon the devolution of chieftainship, the assumption by boys and girls of adult garb, the nose piercing, the right to carry drums and dance, and the right to enter the club house are performed during this festival. Finally comes the killing of the pigs. Between fifty and one hundred pigs may be slain; this operation, watched by everyone with intense interest, is carried out according to a special technique by skilful carvers. The flesh is then portioned out, and the guests, laden with food, both meat and vegetable, return home. The village now has to undergo purification. The women clear away the debris of the feast, and, since the neighbourhood has been denuded of food, the villagers temporarily abandon their homes. For several months they live in the bush and make fresh gardens. When their plants are growing well, they return to the village and resume their normal mode of living.

The outstanding value of the Mafulu Big Feast is the manner in which it brings together into friendly relations members of different communities who may not have come into contact with each other for years. They may even have been hostile to each other, but now one takes the lead and shows the other what it can do in the way of entertaining. The guests bring along all their valuable ornaments and display their wealth before the eyes of their hosts. Thus the vanity of both parties is satisfied and they feel tolerant

and well-disposed towards each other. Eating together spreads goodfellowship amongst them; the fact that they all live and sleep for a few days in the one village makes them feel akin. In the dance they are bound by the rhythm of the drums to act in harmonious co-operation, and the participation of all in the one big festival makes them realize their interdependence.

THE KORIKO FEAST.

It is impossible to reconcile statements that have been made in the past about the utter lack of foresight in economic affairs that is said to obtain in primitive communities with such feasts as the Koriko. This type of feast is the one most frequently held by Port Moresby natives. It consists of the distribution of food to friendly villages when one village has a particularly plentiful supply. The thought or hope which underlies the undertaking is that the recipients of such gifts will return similar presents of food to the donors when the latter are in need. The distribution of surplus food is undertaken here because the native *is* thinking of his future welfare. He is giving away something not out of sheer foolish liberality or love of show, but because he knows that if he keeps the food it will go bad, and that if he gives it away, at some future date, perhaps at a time of dearth for him, he will be given a present of food in return. It is interesting to note, moreover, that before he gives the yams away, he usually scoops out the "eyes" and plants them as seed yams.

THE SOCIAL VALUE OF FEASTS.

The services which ceremonial feasts perform for the benefit of native society may now be reviewed. Perhaps the most important service is that feasting as an institution gives the natives an interest in life. Not only the feast itself, but the preparations for it occupy the people's thoughts and activities for months or even years before the main event takes place. Since war raids are no longer permitted, feasting with its attendant singing and dancing is the only recreation besides smoking and gossiping. European games have been introduced to engage the surplus energy of the young men, but only near the centres of civilization. Cricket and football are not very satisfactory amusements for the elders and middle-aged, who regard them as pastimes for the young men of the village; they like something less exhausting and more dignified to suit their years. Preparing for feasts is an ideal occupation for them; they are given an opportunity of putting into practice their knowledge of tribal custom. The elders, indeed, are reluctant to surrender all leadership to the young men, and to relinquish the prestige they gain in directing the technicalities of festival preparation. The preservation of tribal traditions and ceremonial customs, such as feasts, amounts to the preservation of the emotional disposition on which the society depends for its existence. One writer has pointed out the correspondence which exists between the customs of the tribe, the system of social sentiments, and the manner in which the society is constituted. A change in any one of these three means a change in the whole social fabric. Therefore, if we wish to keep the social tone of a native society in a sound and healthy condition, we must encourage institutions that show themselves to be of real benefit to that society. Feasting is one such institution.

The value of feasts in the maintenance of social cohesion is inestimable. At the Tabu feast of the Koita, for instance, isolated units of the tribe are collected into one village and for a short period act together as one big community. Kinship ties that might otherwise have been forgotten are renewed and strengthened. Under the mellowing influence of food petty animosities are converted into toleration and even friendliness. When the guests go home to their distant villages, they carry a pleasant memory with them which makes them all the more disposed to keep up their connections with other units of their own tribe. Funeral ceremonial provides a means whereby social well-being is restored after a period of anxiety and unrest.

Dubu or open club-house of Hanuabada village (Port Moresby, Papua). The Tabu and certain other festivals centre round this structure, which at ceremonial periods is the object to which all eyes continually return. Expert craftsmen have carved and painted the dubu posts, the ends of which represent in conventionalized form the crab or lobster claw.

[Photo.—*Capt. Frank Hurley.*

One of the first reasons given by Government officials for the encouragement of feasts is that they are the best known stimuli to economic activity. When the natives have a feast to work for their industry is remarkable compared with times when there is nothing special on the programme. The accumulation of a good food supply means hard work in the gardens for at least a year. When the big day is at hand, all the men that can be spared are engaged in fishing and in hunting for wild pig or wallaby. The principle of mutual assistance is brought into play and the organizing ability of the chiefs and elders tried and tested. Far more food than can possibly be eaten during the festival is provided, but it is all shared out among the guests to be taken home and consumed there; the emphasis lies upon the liberal giving away of food, not so much upon the eating of it. Thus do needy communities benefit by these feasts.

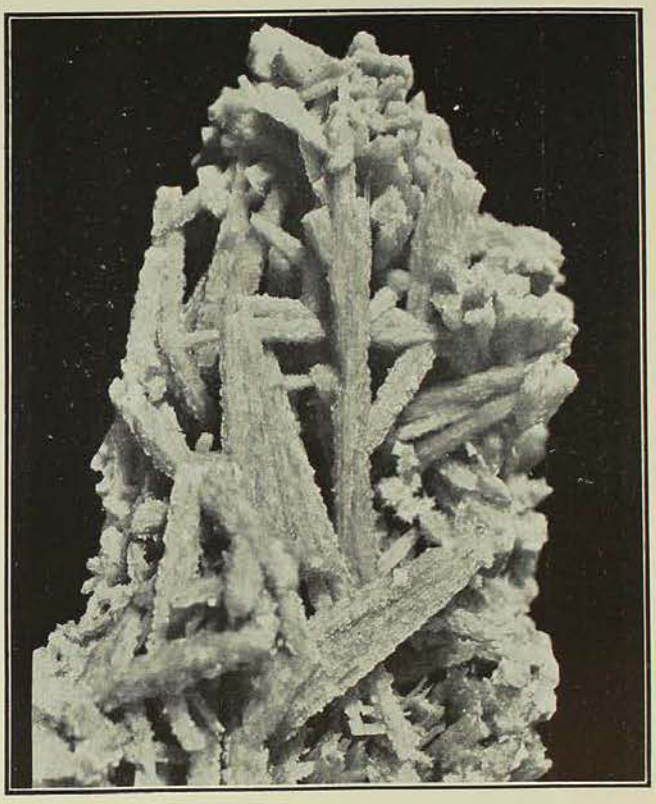
Again, when a new club house is built, a great deal of time is spent by native artists in carving and colouring the posts. At the inauguration feast, the beauties of the new structure are pointed out by the proud owners, and the skill and industry of the carvers are praised. Thus feasts do something towards the encouragement of native art—they help, indirectly, to keep alive a certain æsthetic sense.

The Broken Hill Proprietary Block 14 Company, Limited, Mineral Collection

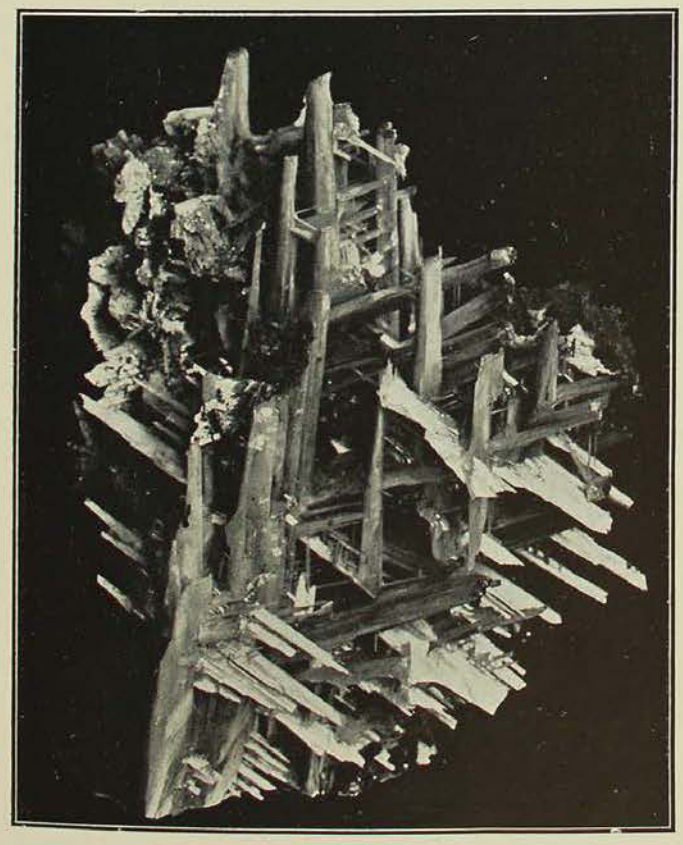
BY T. HODGE-SMITH.

THE decision of the Broken Hill Proprietary Block 14 Company, Limited, to present to the Trustees of the Australian Museum its collection of Broken Hill minerals, has resulted in the Museum collection being enriched by what is probably the finest suite of Broken Hill cerrussite to be found anywhere. Apart from the particular beauty of individual specimens, the most striking feature is the great variety of crystal habit, from a mass of interlacing needle-like crystals forming the beautiful reticulated cerussite to an individual arrowhead weighing a pound or more.

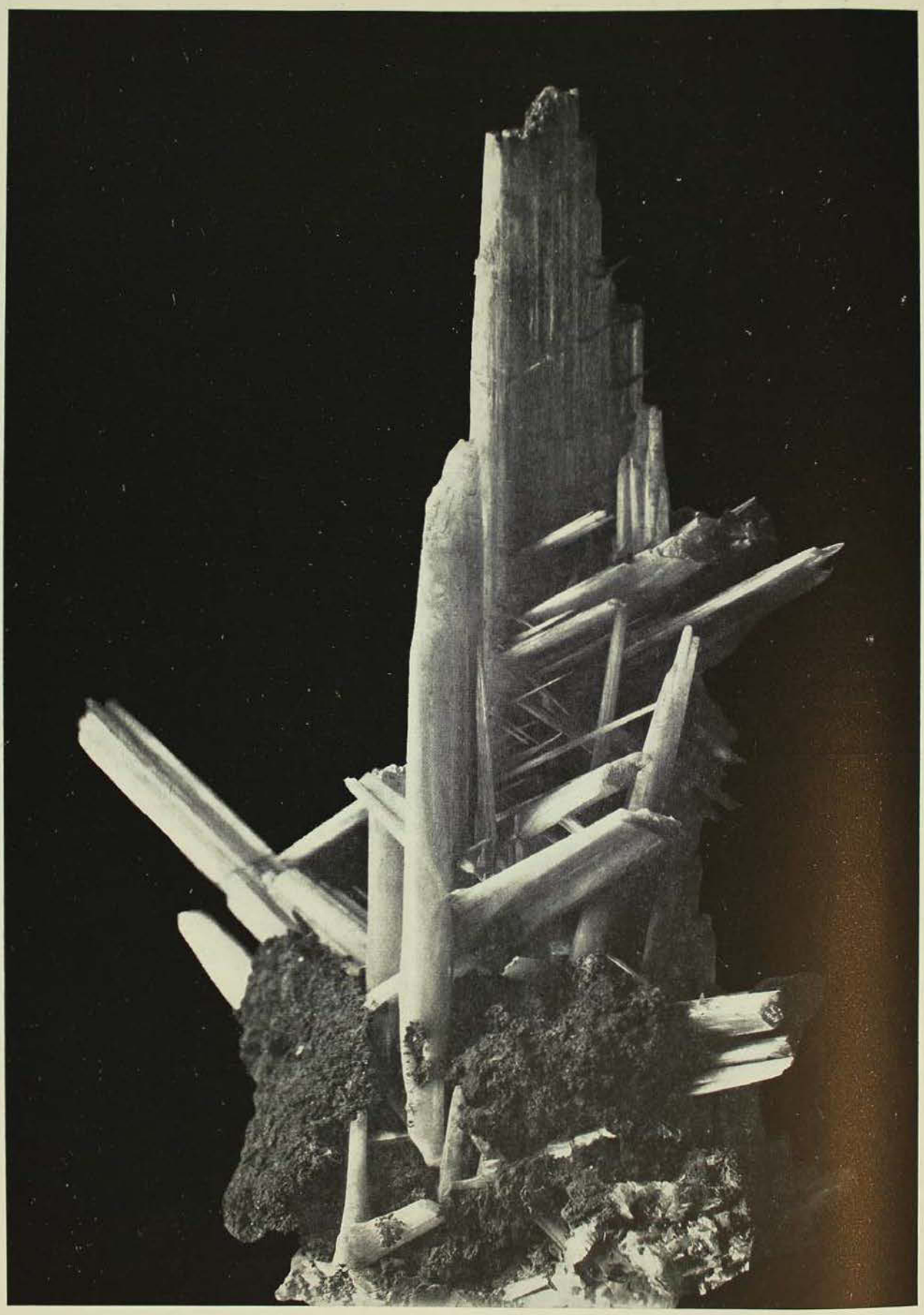
The largest specimen, weighing more than one hundredweight, consists of a mass of fluted columnar crystals measuring up to ten inches in length and about half an inch in diameter. Perhaps the most remarkable specimen is one that I have heard several people, quite independently, liken to a sailing vessel. It is a stellate group of interpenetration twins with only three rays of the star present. The middle ray is eleven inches long and three inches wide, tapering from three-quarters of an inch in thickness at the base to a sharp edge at the top. Its pure white colour together with a number of attached acicular crystals go to make up the resemblance to a sail with its rigging. Last, but by no means least, are the delightful groups of butterfly twins, so called because they resemble the opened wings of a butterfly.



Cerussite, Block 14, Broken Hill. A group of fluted columnar crystals.
[Photo.—*Daily Telegraph.*



Cerussite, Block 14, Broken Hill. A reticulated group.
[Photo.—*A. Musgrave.*



Cerussite, Block 14, Broken Hill. A stellate group of twinned crystals, the principal ray of which is eleven inches long. Supposed to resemble a ship.
[Photo.—*A. Musgrave.*

Cerussite, Block 14, Broken Hill. One of the butterfly groups.
[Photo.—*A. Musgrave.*

The collection is by no means limited to cerussite, which, by the way, is the carbonate of lead, but a number of rare and beautiful minerals from the Company's mine are included.

One specimen of pyromorphite, consisting of branching crystals of brown colour, is by far the largest specimen of the rare mineral yet secured by the Trustees. Pyromorphite is the chlorophosphate of lead, crystallizing in the hexagonal system, and the branching crystals of the specimen clearly illustrate its hexagonal form. Another specimen of this mineral, though not nearly so large, is particularly interesting because of the contrast of colour shown in specimens from the one mine. The colour is pale canary yellow.

Specimens of crystallized azurite (basic cupric carbonate) are of particular interest, while among other minerals are copper, galena, cuprite, malachite, smithsonite, anglesite, rhodonite, and chrysocolla.

The public spirit and generosity of the Company, and particular mention must be made here of the General Manager, Mr. F. Voss-Smith, is very greatly appreciated by the Trustees. It is to be remembered that Broken Hill, as a mining centre, is famed throughout the world. The wonderful richness and infinite variety of minerals of the upper levels of the lode have probably never been exceeded. Naturally this part of the lode has long since been worked out, and it is no longer possible to secure specimens such as were obtained in the early days of the Hill.

The Company is to be congratulated on safely preserving such an excellent collection of these minerals from the upper levels of their mine. The care taken of this material can be appreciated only when one realizes how extremely fragile and heavy cerussite is.

The collection is now shown in the Mineralogy Gallery of the Museum, and this generous donation makes it possible for our visitors, who number more than a quarter of a million annually, to gather some idea of the wonderful works of Nature that were opened up by the mining engineers, who worked against untold difficulties in those early days to make Broken Hill what it is to-day.

If other mining companies had followed the example of the Broken Hill Proprietary Block 14 Company, what a record of the mineral wealth of this State could be displayed.

Notes and News

Mr. Ernest Wunderlich, F.R.A.S., formerly a Trustee and President of this Museum, has generously presented several volumes issued by the British School of Archæology in Egypt. Mr. Wunderlich has borne in mind the needs of this Museum upon many occasions, and his thoughtfulness is much appreciated. The limited resources at the disposal of the Trustees make this presentation doubly welcome.

* * * *

Two important pieces of fieldwork were carried out during May and June. Mr. R. O. Chalmers spent about four weeks investigating the occurrence of stilbite in the Garrawilla district, near Gunnedah, where this mineral is found over a large area. He made an extensive collection, including many fine samples of this zeolite.

A party consisting of Dr. C. Anderson, Messrs. H. O. Fletcher and G. C. Clutton visited Cuddie Springs, near Brewarrina, and made extensive excavations in search of fossil bones. This locality has long been known as a repository of fossil marsupials and other animals, but it has not hitherto been systematically examined. On account of the prolonged dry spell, it was found possible to sink shafts and make trenches of considerable depth, and a large collection of bones was made, though, unfortunately, many of these were very fragmentary in character. The most interesting finds were a number of reptilian teeth, believed to be those of *Megalania*, a large extinct lizard allied to the goanna, and leg bones of a gigantic struthions bird, *Genyornis*, previously described from Lake Callabonna, Central Australia. An article describing the fossils of Cuddie Springs and the work of the expedition will appear in a future number of the MAGAZINE.

Recent visitors include Dr. Hugo A. Bernatzik, of the Hofmuseum, Vienna, who has just returned from the Solomon Islands, and is now on his way to the Mandated Territory of New Guinea; Professor E. W. Skeats, University of Melbourne, who was much interested in the mineralogical collection and our methods of storing minerals and rocks; Dr. Brooke Nicholls brought with him an interesting and instructive series of enlarged models of the teeth of various marsupials.

* * * *

Mr. R. O. Chalmers, Cadet in Mineralogy and Petrology, has been successful in gaining the Associateship of the Sydney Technical College in Geology, with highest honours and medal. Sincerest congratulations are offered to him on this fine achievement.

* * * *

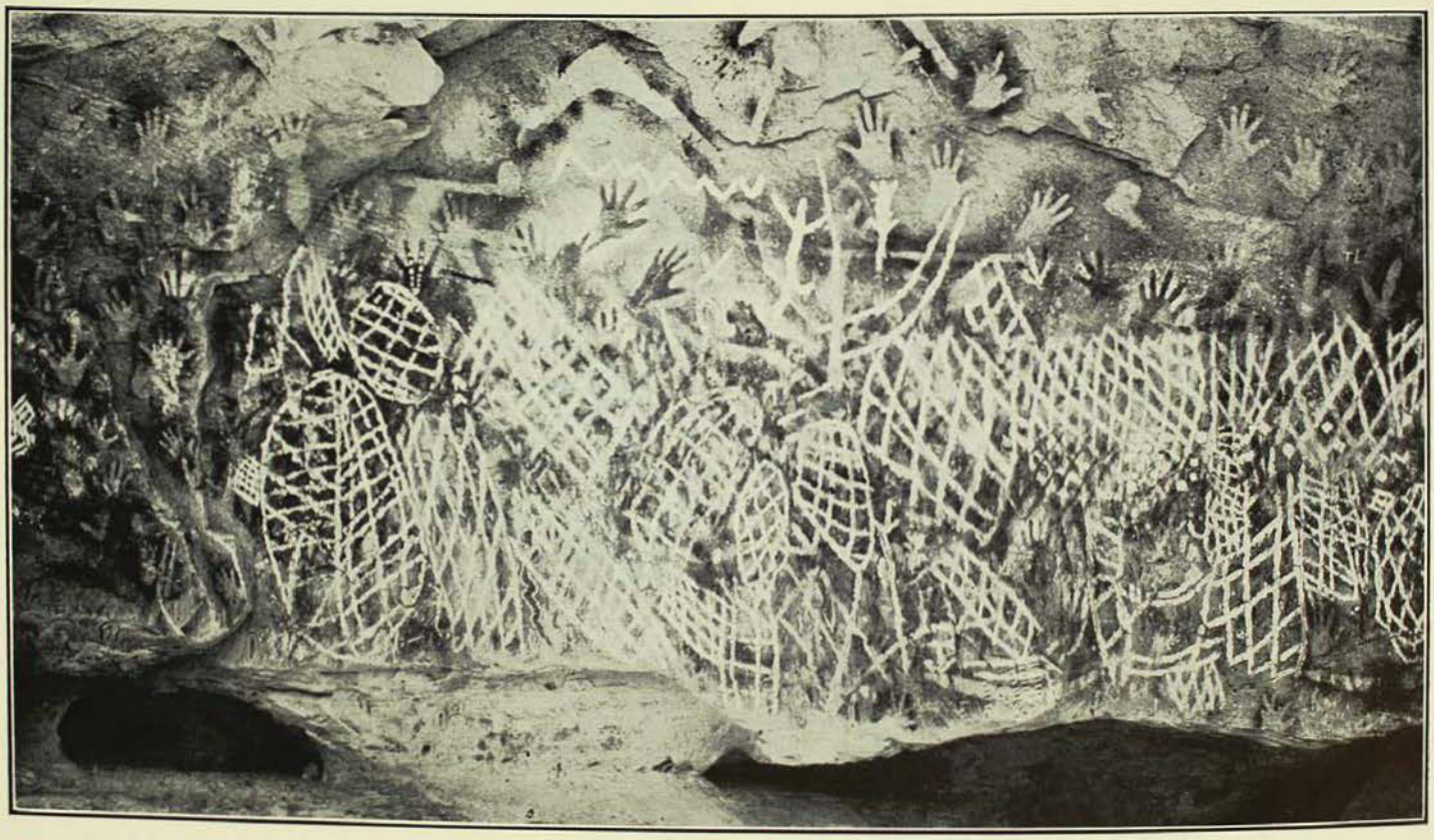
Mr. G. Aiston, of Marree, South Australia, co-author with the late Dr. G. Horne of *Savage Life in Central Australia*, has presented a representative series of stone implements from the Lake Eyre district. It includes two ground stone axes of distinctive type, beautifully worked pirries, used and unused tuhlas, a grinding stone of an unusual kind, and a number of magic stones.

The ethnological collection has also been enriched by the purchase from Mr. G. E. Archer Russell of a collection of flakework from various localities in South and Central Australia, including a skin-scraper of slate, used by the natives of the Adelaide Plains and new to our collection. Some of the chipped implements are of similar type to those found on the coast of New South Wales. As these localities have not hitherto been represented, this new material forms a valuable acquisition.

An Aboriginal Art Gallery

BY M. STARK.

IN a narrow valley about eighty miles north-east of Blackall, Queensland, walled in by cliffs of the old desert sandstone, is to be found what is perhaps the most extensive "gallery" of aboriginal rock drawings known to occur in Australia.



Aboriginal rock drawings.

[Photo.—*T. B. Watkins.*

To reach this region one travels by car through what is locally known as "the desert". For the last eight miles logging tracks made by cypress pine cutters are followed and, finally, a mile or so is traversed on foot. Emerging from a thicket one comes on a high cliff of massive sandstone, rising abruptly from the sandy plain. With a face not more than ten feet across but stretching back as far as the eye can see, and ever widening, this forms a small plateau covered thinly with timber, mainly acacias. The walls are weathered and worn and pitted with caverns, while blocks of stone of fantastic shape encumber the base.

About a quarter of a mile away and rising higher still is another rock wall about eighty feet in height, the base composed of light coloured sandstone, which becomes bluish grey and yellow at the top. In the distance are seen similar steep-sided narrow mesas, while still farther away appears the blue line of the Dividing Range.

In the fierce sunlight the rock walls stand out white and the caverns appear as black hollows. A nearer approach reveals that the whole face of the white cliff is ornamented with carvings and drawings, a veritable picture gallery of aboriginal art in browns, yellows, and whites. For fully 150 yards and up to nine feet from

the base the wall is covered with the work of the aboriginal artists who, at one time, lived, hunted and played in this district, but have vanished, leaving only these crude pictures as a memento of their former presence. In spite of sun, rain and wind, the paintings are still well preserved, testifying to the lasting qualities of the colouring matter used.

Every nook and face of the white cliff, where examined, showed some print or carving where, perhaps, some beginner tried his " 'prentice han' " before working on the main wall. One notices, too, the march of progress, as technique improved, in the adoption of a different method of representation, and, in parts, one series of paintings is superimposed on another, even as the old masters obliterated one painting and placed another over it.

Hands alone, or hands with wrists and arms, some thin, others plump, varying in size from the tiny hands of a child to huge paws, are most numerously represented, while on the lowest part of the cliff are depicted feet, some with extra large toes, and one with a length of eleven inches and a width of five. About waist-high on the wall appear the imprints of a child's two tiny feet, and one can imagine some fond mother holding her offspring while its photo, feet imprints in this case, was being taken.

In a number of cases the hands represented are abnormal. In one instance the thumb is turned down as if double-jointed or broken; in another the first joint of the index finger of the right hand is turned to the left, perhaps indicating the result of injury in battle or play; in others only the index finger and the thumb are complete, the other digits having only one joint. A hand consisting of a thumb and two giant fingers had been produced by pressing together two fingers to make one, and examination reveals that some of the apparently maimed hands have been made by the simple method of turning down some of the joints of the fingers.

Sometimes the stencilling method has been employed, the object to be represented being placed on the rock and the colouring matter daubed on or blown around it. Or the impression method was used, the object being dipped in the colour then pressed on the wall to form an imprint. The impression method was evidently the first to be used, for the later drawings have been placed over some produced in this manner. These later drawings show the use of a new medium, a brilliant white paint being put on with the finger, or perhaps with a stick or crude brush. Much of the colouring matter was doubtless obtained from the terraces above, for there were to be seen reds, browns and yellows, as well as cavities from which, apparently, colours had been removed.

Hand prints and other designs.
[Photo.—*T. B. Watkins.*

What look like broad boomerangs, but are more probably clubs of a special form, are depicted in numbers, and there is a

single representation of a nulla nulla. Axe blades, four inches by four inches, with a fourteen inch haft and one unusual type, the blade one and a half inches wide by six inches in length, with a ten inch haft, were all produced by the stencil method. On the other hand, what look like broad arrows, emu tracks, or spear heads were painted on. A pair of long horizontal lines, four inches apart and meeting at both ends, with a total length of six feet, and another pair with blunt ends, showing a bulge in the middle crossed by ladder-like lines, may represent snakes or processions of blacks.

We can but conjecture as to the significance of many of the designs, such as wavy lines of successive V's linked together, ovals and oblongs, curved and straight lines with criss-crossing lines, what look like shields, fish nets, dilly bags, or baskets, central dots with radiating spidery lines and many others, all executed in yellow, red or white. The acme of aboriginal art seems to have been reached in the white medium, for we have, standing out as if enamelled, the representation of a lizard and, apparently, a flying squirrel. Kangaroo paws, emu tracks, and what look like fern fronds or compound leaves, are also freely represented.

One finds, too, cuttings in the rock, for the engraver as well as the painter has been at work. Some are merely straight lines, others have a central line from which shorter lines radiate, recalling the backbone of a fish or other animal. One wonders what is signified by a group consisting of four upright lines, an inch in length, with a longer one of four inches, followed by five short ones and another long one.

Some of the drawings are as high as twenty feet from the ground, showing that the same spirit of emulation existed among the aborigines as is evidenced at modern holiday resorts, where visitors vie with one another in attempts to place their names at the highest possible point. Visitors to the Blacks' Palace have not been able to resist the temptation to carve or write their names on the rocks, and, sad to relate, in some cases over the original pictures. Something should be done to prevent this mutilation of these interesting aboriginal relics.

Odd bones scattered about on the floors of the caves perhaps indicate that this was an old burying place, but collectors or vandals have removed all the bark-enclosed skeletons. No implements are to be seen on the surface, but excavation in the floors of the caves or in the sandy soil at the base of the cliff might bring some to light.

The region now suffers from a lack of water and scarcity of game, but no doubt, when the drawings were executed, animal life was abundant, and as for water, the blacks knew of sources, knowledge of which is denied to the whites. Or perhaps it was visited only in good seasons, when, maybe, it was a common meeting ground for ceremonies and play, where tribes ordinarily hostile to one another met in amity, as did the coastal tribes in the great feast of the Bunyas. This, however, is but speculation, for no one is left who can tell us when, how or why these rock pictures and carvings were made to form a "National Memorial" of a race which is soon to pass to extinction. To the blacks, this work must have represented the perfection of art, though to us they may seem merely childish drawings.

Bird Economics

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

DURING the course of a year, many enquiries are made at the Museum regarding the food of birds, but it is not always that a definite answer can be given. While a complete economic survey of birds has not yet been carried out in Australia, a certain amount of work has been done by individual ornithologists, and it is from the result of their research that we are in a position to declare, fairly accurately, the economic value of a large percentage of our species of native and introduced birds.

Some years ago a controversy arose over the value of an introduced species, the Red-whiskered Bulbul (*Otocompsa emeria*),[1] but a brief investigation proved that, while this bird destroyed many kinds of insects, including the destructive vine-moth caterpillar, it also attacked soft fruits and the young green sprouts of several kinds of plants. The Bulbul is a cheerful and attractive bird, of that there is no doubt, and it has many friends, but, on account of its bad habits, it must be classed as an undesirable immigrant. The place the Bulbul occupies in our gardens can be filled by any one of many Australian birds, particularly the Pallid and the Fan-tail Cuckoos, two species which revel in a meal of caterpillars, cut-worms and other destructive insects.

Another bird about which there is a divided opinion in the country is the Bee-eater or Rainbow Bird (*Merops ornatus*). The stomach contents of only twenty or so specimens have been examined, the food eaten consisting of many kinds of insects, the most prominent being dragon flies, moths, beetles, flies, and bees, both native and introduced. There is not much doubt that round and about apiaries the Bee-eater does some damage, and apiarists have good cause for complaint, but in other localities it could not be classed as anything but a useful species. The same remarks might be applied to some of the wood-swallows belonging to the genus *Artamus*, for, whilst a few birds have been seen to snap up bees, the great majority prefer flies, small beetles and grasshoppers. Wood-swallows are exceptionally valuable birds in orcharding districts, to which places they usually flock when the fruit-destroying insects are most abundant.

The Crow and the Raven are birds with reputations as black as their plumage, nevertheless, the crow is as white at heart as are the bases of its feathers. It is mainly insectivorous, feeding on grasshoppers, crickets, caterpillars, and many kinds of beetles. Crows also pay a great deal of attention to the carcasses of sheep, cattle, and other animals, gorging on the larvæ of blow-flies, and, therefore, the bird is a benefactor to the sheep man. The Raven, often mistaken for a crow, is a bird of a different character, as it attacks lambs, and weak and ailing sheep and game, doing much damage during the lambing season. Even so it has a few good points, inasmuch as it is a scavenger, devouring carcasses that otherwise would be the breeding grounds of millions of blow-flies.

The food of the introduced Starling (*Sturnus vulgaris*) has not yet been fully worked out in this country, but in the United States of America, where the stomachs of several thousand starlings were thoroughly examined, it was proved that the bird was over eighty per cent. beneficial. Unfortunately, the twenty per cent. damage was confined chiefly to the cherry orchards of Kentucky and the orchardists there suffered considerable loss. A glance at the records of Austra-

[1] Kinghorn.—THE AUSTRALIAN MUSEUM MAGAZINE, i, 5, July, 1922, p. 152; *ibid.*, i, 7, January, 1923, p. 219; *ibid.*, ii, 9, January-March, 1926, p. 312.

lian investigations shows that the starling is a pest in orchards, and in its habit of nesting in houses; it is undesirable because it is pugnacious towards our native birds and takes possession of their nesting sites. On the other hand, in mixed farming and grazing country it is beneficial, as it confines its attention to grasshoppers, caterpillars and other insects, eats very little grain, and has often been observed picking ticks from the backs of sheep. The Starling was introduced into Australia about 60 years ago, and from a few pairs has increased its numbers to millions. From some investigations[1] I have been carrying out, it is now known that this species is distributed over the whole of the south-eastern portion of the continent and Tasmania. It does not extend to Western Australia, Central Australia, or far north into Queensland, but it is abundant in the coastal districts, visiting the tablelands in large flocks throughout the year; it is only an occasional visitor to the drier inland areas, in which areas it would, if in sufficient numbers, be a desirable and valuable destroyer of caterpillars and grasshoppers.

Many of the species of birds which occasionally come in for severe criticism are game birds such as quail and ducks. These do not always deserve the unkind remarks made about them, but some over-enthusiastic sportsman or a body of shooters think that by condemning the bird a longer or even a permanent open season will be proclaimed. This, of course, is a very selfish attitude, and is fortunately confined to a certain class of "shooter".

Economic ornithology is not carried out in this country to the same extent as it is in some others, such as the United States of America, where a special department is carrying out investigations year in and year out. It is an expensive study, though not by any means an unprofitable one; in fact it is one which could be classed as most profitable, not only to primary producers, but to the whole country. It deals with the food of birds in relation to agriculture generally, the many influences which effect changes in food habits, changes brought about by environment and the advance of settlement, and many other things. With a department of economic ornithology in Australia, we should, within a few years, be able to tell the people of the country the value of a bird in £. s. d., as has been done in some other countries, where certain species of hawks, on account of their food habits, have been declared to be saving about five pounds each per annum to the farmer who allows them the freedom of feeding on pests round about his farm.

[1] Kinghorn.—*The Agricultural Gazette of N.S.W.*, xliv, 7, July, 1933, p. 512.

The extraordinary invasion of Corner Inlet, Victoria, by swarms of the crab, *Leptomithrax spinulosus*, has created a good deal of public interest. Examples of this crab, kindly lent by Professor W. J. Dakin, University of Sydney, have been on view in the Museum for some time, and a number of specimens have been presented by Mr. Melbourne Ward, Honorary Zoologist.

* * * *

An interesting letter has been received from Miss Evelyn Cheesman, who is at Kokoda, Papua, collecting for the British Museum, and apparently with great success. At the date of writing, 25th May, she had already secured 5,000 insects, in addition to frogs, lizards, and crustaceans. Miss Cheesman has been astonished by the large size of some of the insects collected; for example, two supposed tadpoles turned out to be mosquito pupæ. Malaria is prevalent at Kokoda, and Miss Cheesman has already had one nasty bout, and has also experienced leeches and "scrub itch" and been stung by a colony of wasps. But nothing can damp her enthusiasm or cheerfulness, and her only comment on these mishaps is that they make her feel quite like an old resident.

Silk and its Economics

By K. C. McKeown.

IN a previous article[1] I dealt with the silkworm, its life, habits, rearing, and the ailments to which it is heir. We now come to that time when it is necessary to remove the silk from the cocoons.

WINDING.

When the cocoons have been spun, the next activity is the preparation of the silk. In order to prevent the emergence of the moth, which by cutting the silk filaments of the cocoon renders it useless for winding, it is necessary to kill or "choke" the chrysalis of all cocoons not required for breeding purposes. Leaving the cocoons exposed to the hot sun will suffocate the chrysalides, but it also hardens the gum in the thread, making unwinding difficult and wasteful. Killing by means of steam necessitates the cocoons being dried in the shade and turned constantly in order to prevent putrefaction of the dead pupæ; this method is also liable to injure the silk. The most efficient method is that of dehydration at a temperature of 200° F. for twelve hours; this method also has the advantage of drying out the dead chrysalides. After "choking", the cocoons must be sorted according to the quality and colour of the silk in order that the grades may not be depreciated by mixing two or more qualities.

The cocoons may be sold as they stand or the silk reeled. There is no market for cocoons in Australia, and no prospect of one, and if the cocoons are sent to Europe the bulk is so great that the cost of transportation would be excessive. The price for cocoons in Europe is about 1/– per lb., so that, taking freight, etc. into consideration, this method offers no possibilities.

The actual winding of the silk is frequently considered to be a "cottage industry"; the necessary plant is not very costly, but where the workers are lacking in experience, variation in the quality of the silk and in the weaving will invariably occur, and much of the work will be useless and of little or no value. Silk manufacturers have no use for numerous small quantities of silk ranging from a few ounces to a few pounds and of equally variable quality. In order to compete with imported raw silk it would be necessary for the work to be organized and carried out under supervision in order to ensure a uniform quality of silk.

Reeling can only be economically done by proper machinery. In France one girl can attend to several of these power driven machines, whereas, if the unwinding is done by hand, a person can only unwind about 22 grammes of silk in five hours. Such silk can be sold at 15/– to 20/– per lb., and, when we take into consideration the cost of rearing the worms, it will be readily understood that this method of unwinding is not one which can be recommended. The current price of silk ranges from about 2/6 to 20/– per lb., according to quality, etc.

The work of winding may be briefly described. The cocoons are placed in a dish of water maintained at a temperature of about 180° F. in order to soften the natural gum (sericin or silk albumen) with which the silk is coated. The cocoons are repeatedly dabbed with a stiff brush until the ends of the filaments float out from the cocoon upon the surface of the water. The filaments from five cocoons are gathered in the hand of the operator, who simultaneously twists them and threads them through attachments to the winding apparatus, which then mechanically twists them as the silk is wound, either by hand or power, on to the spools. Constant supervision is necessary, as in the event of a filament breaking or the silk on a cocoon running out, another

[1] McKeown.—"Silk Culture", THE AUSTRALIAN MUSEUM MAGAZINE, v, 2, April-June, 1933, p. 57.

filament must be immediately added to maintain the thickness of the thread. Thin patches in the thread render it unsatisfactory for weaving.

QUALITY OF SILK

Rawlley in his work on the silk industry says: "The defects which affect the quality of goods produced may be subdivided into two heads, lack of evenness and cleanliness. The former is represented by fine and coarse threads, and is a result of the reeler who fails to nourish the thread with the necessary cocoons, and after discovering that the thread is running fine adds several fibres at once with the result that the superfluous ends increase the diameter of the thread to an appreciable extent, and during the process of cleaning are at once caught by the cleaner. . . . Thus there is a lack of uniformity in the size of the resultant thread, in other words, there is deviation from the mean denier on which the raw silk is sold. The defect is serious and badly impairs the quality of the goods produced . . . and sometimes the finished goods have to be sold as defective. Next comes cleanliness, lack of which renders the quality of the manufactured product unsatisfactory and makes it unmarketable under the grade in which it is intended to be sold.

"In the reeling department, efficiency means a great deal because the quality and size of the raw silk depends on the deftness and carefulness of the worker. A little neglect on her part spoils the final thread and causes great variation in the size of the raws."

Cocoons of *Bombyx mori* weigh from 270–600 to the pound. About one-sixth of this weight is silk and of that one half can be reeled, the remainder which cannot be reeled consisting of surface floss or blaze and the husk of the chrysalis. The silken filament of a cocoon is continuous and varies in length, and often exceeds 1,100 ft. in length.

"Silk is graded for thickness of thread like cotton, but instead of the size being termed 'counts' it is measured in 'deniers'. The French 'denier' weighs one-twentieth part of a gramme, the standard of length being 450 metres and the weight the denier. A silk cocoon has a filament of three deniers in its early stages of unwinding, two and a half deniers in the middle and two deniers at the end." (Rawlley: *Economics of the Silk Industry.*)

The term "bave" is used to denote the diameter of the filament. The bave of *Bombyx mori* silk varies from 0·00180 to 0·0033 cm.

No statistics with reference to the imports of raw silk into Australia appear to be available, but some indication may be obtained from that used by one Australian factory. Their consumption of raw silk varies very considerably, according to the dictates of fashion, but at the present time they are using 350 lb. of raw silk per day in the manufacture of hosiery. This silk is imported from Japan at a landed cost of 19/8½ per lb., duty free. The necessary handling, degumming, or removing the sericin, and spinning into thread under Australian conditions adds about another 15/– per lb. to the cost of the silk, bringing the cost to 35/– per lb. for the silk in the thread ready for weaving.

It may be of interest to give here a few figures to illustrate the present position of natural silk as against artificial silk, which is competing, not only with natural silk, but also with cotton and wool. As stated above, one factory uses 350 lb. of raw silk per day at a cost of 35/– per lb. ready for weaving. Of artificial silk 500–1,000 lb. per day is used in hosiery, and a further 2,000 lb. per day in underwear. This artificial silk is imported at a landed cost of 3/5 per lb. ready for weaving.

ECONOMICS.

Labour and Wages. The question of labour and wages must enter very largely into any consideration of the establishment of sericulture in Australia, and it is undoubtedly upon this aspect that any possible success in the industry stands or falls. The question is a large and intricate one, and it is my intention to quote the opinions of recognized experts

in various parts of the world in order that their bearing upon Australian labour conditions and wages may be estimated.

Rawlley in his *Economics of the Silk Industry* (1919) says: "An adequate supply of cheap labour is an essential factor which determines the growth of the silk producing industry. In some of the newly developed countries, where the wages are very high, the production of silk on a commercial scale is practically impossible, as the product of a silk industry built on high wages cannot compete with the product of the Japanese and Chinese silk producing industries. It will be shown . . . that the problem of foreign competition as affecting the silk producing industry is governed by the comparatively cheap production of raw silk in Japan and China, and, therefore, all questions relating to the price of labour in the modern silk producing countries are ultimately decided on the basis of the Far Eastern competition.

"In France the filatures are sometimes idle owing to the diversion of the workers from the reeling industry to other more remunerative occupations, and the progress of the industry is greatly hampered.

"An increase in the price of labour causes, other conditions remaining the same, an increase in the cost of production of the raw silk, and as this commodity is produced in countries widely different from each other in general respects, a high cost of production in one country leaves no scope for normal competition.

"The first important factor that exercises a great influence on the wages of labour in the cocoon-producing industry is the cost of living. In different countries the actual wages may, perhaps, equalize in the long run, but the money wages do not show any such tendency. The absence of equalization in the money wages is due entirely to differences in the cost of living. In China, Japan and Bengal, the bulk of the rearers live on rice and vegetables under simple conditions, and do not as a rule receive more than about 3d. or 4d. a day. In France, on the other hand, owing to the higher cost of living, the rate of wages is correspondingly higher. In pre-war days the women and men who directed operations in the sericultural establishments received about 1 franc 50 centimes a day, with board and lodging, and the assistant workers received from 75 centimes to 1 franc a day, according to age, with board and lodging. The rate of wages has risen considerably during the war and last year the sericultural workers received from 3 francs 50 centimes to about 5 francs per day. The rate of remuneration in the eastern countries does not undergo visible changes within short periods." And again: "The average rate stood at about 1 franc 60 cents. a day in the reeling factories till the year 1913. There is no doubt that the wages have risen considerably since the war, but it is not possible at present to estimate the exact variations that have taken place during the last four years. In the southern departments of France there was a visible increase of more than 100% in 1917 on the pre-war rate. The information received by me from direct sources points to a universal rise in wages, and in some cases the proprietors of the filatures are compelled to pay as much as about 4 francs per day. But this increase in the rate of wages of the filature hands does not indicate a proportional increase in prosperity, as the cost of living has also considerably increased in France during the last three or four years owing to the war conditions.

"In dealing with the rate of wages in the reeling industry it must be remembered that the element of international competition plays an active part in the determination of the scale of wages . . . Moreover, apart from the question of wages, there has been a marked improvement in the quality of the Far Eastern raw silks in recent years, and this new factor makes the competition still more difficult. It is evident that success in the reeling industry depends to a large extent on the cheapness of labour."

An estimate of the profits from silk rearing are set out in the following figures for 1919, the latest available:

France—

Gross earnings from 50 kilos of cocoons at 0·60 franc per kilo	180·00 francs
Cost of producing 50 kilos of cocoons	120·50 francs
Net earnings	59·50 francs

"Raw silk can only be brought to the market where there is abundant and very cheap labour—the fact that China, Japan, Bengal, Piedmont and the Levant are the principal producing localities making this plain." (*Chambers' Encyclopædia*, 1927.)

"The industry in India is almost entirely a cottage one, *i.e.*, a subsidiary industry, it is simple and inexpensive, and can easily be carried on in their spare time by women and children, who ordinarily have almost nothing to do on account of the Purdah system. The cost of labour does not count in such cottage industries in all parts of India, although the same industries, if they were run on a large scale, would cost an enormous amount in labour . . . The margin of profit in the industry is small, and the utmost economy should be observed. At the present time, the industry is scarcely profitable with hired labour, as the price of food stuffs has risen and labour become dear in consequence." (M. N. De.: *Bull. No.* 39. *Agricultural Research Institute*, Pusa. Instructions for Rearing Mulberry Silkworms, 1921.)

According to the late Professor Lefroy a good rearer in Kashmir receives about £2 10s. 8d. for 300 lb. of cocoons, and most good rearers get 26/8 clear. The average rearer earns about 14/– during a period of one month, or slightly more when he is engaged in rearing. If the rearer is efficient he can earn more by increasing his output, but beyond a certain limit the output of cocoons depends more on circumstances than on personal skill.

In the reeling industry at Srinagar (Kashmir) wages are paid at the rate of 1d. per day per skein: the four-skein or best reelers would, therefore, make 4d. per day.

PRESENT POSITION OF THE INDUSTRY.

In considering the future of the industry one factor must be noted, and that is that despite the impoverishment of Europe by the world war and the increasing output of artificial silk, the demand for natural silk products has steadily increased during the last ten years and so has the total production of raw silk, but this increase in production is almost wholly confined to the Far East.

"In 1875 Western Europe produced about 46% of the world's commercial supplies of natural silk, but by 1925 it was barely 12%." (*Ency. Britt.*, 1929.) Rawlley states that "the production of cocoons in France is in a progressive decline."

Even in the case of India there has been a falling off in production. "There was a time when India used to export Rs. 15,532,290 worth of silk per year, but this has now come down to Rs. 5,055,288." (M. N. De., 1921.)

In considering the figures given above, it should be remembered that the production of silk in France, Japan, and other countries is backed by State bounties.

SERICULTURE IN AMERICA AND AUSTRALIA.

Since the economic conditions in America possess affinities with those of Australia, I will give a brief outline of the history of the efforts which have been made to establish the silk industry in that country before passing on to our own experiences in this direction.

America. Chambers' Encyclopædia gives the following:

"The history of silk production in America dates from 1530, when the first mulberry trees and silkworms were imported into Mexico. But by 1600 the industry had died out there, and a like fate overtook it in Virginia before the end of the next century, and practically everywhere by the beginning of the 19th century, although it had been vigorously encouraged by England, filatures established, and Georgia alone in one year had sent home nearly 2,000 lb. of raw silk. About 1825 a powerful effort was made to revive the industry in the United States; silk societies were established and manuals of silk culture, such as J. A. Cobbs', printed and distributed by State

legislation and by Congress, but success was prevented by a craze for speculation in Chinese mulberry trees, which ended in widespread ruin in 1839. Since then silk culture has never flourished in America. It was taken up with eagerness in California in 1858 but quickly dwindled and died. There is a State board of silk-culture in San Francisco, but it has not succeeded in arousing much interest in it. At Philadelphia a women's Silk-culture Association was founded in 1876, so far with the same result, nor has commercial success encouraged the attempts of the Agricultural Department, which established a filature in Washington in 1886 for reeling from American cocoons, and has distributed eggs of large Milanese silkworms."

Rawlley says that: "The U.S. Department of Agriculture, with appropriations made by Congress, conducted extensive experiments in sericulture. It was shown that cocoons of excellent quality can be produced in many localities in the United States, where the white mulberry grows well, but the conclusion reached by the Department was that under the then existing conditions the raising of silk could not be made commercially successful."

Australia. There is every indication that provision was made during the earliest years of settlement in Australia to establish the silk industry, since the mulberry was amongst the first trees introduced into the Colony.

In 1825 the Australian Agricultural Company was formed in England . . . to plant the mulberry for silk production.

In 1842 Surgeon R. G. Jameson's "Recent Travels in New South Wales" refers to silkworms having already been introduced, and he comments that the scarcity and high price of labour militate against success.

Brown, *History of N.S.W.*, states that in 1845 silk culture was established on a small scale.

In 1848 Benzeville made an effort to establish a farm for silk culture near Ryde, but the attempt was a total failure.

Nothing further seems to have been attempted until 1862, when C. Brady is reported to be silkworm-rearing on the Tweed River, and in 1870 he petitioned the Colonial Secretary, pointing out the benefit to the State in establishing the industry and urging assistance.

The Victorian Government granted an area of 1,000 acres of land at Mt. Alexander, near Castlemaine, to the Victorian Ladies' Silk Association under the leadership of Mrs. Bladen Neill of Corowa, as a sericultural farm. It is reported that Mrs. Neill "went in for the production of a large number of Silkworms before she had food for them". Failure also attended her efforts at her farm at Corowa. The Victorian Ladies' Silk Association (or Victorian Ladies' Sericultural Co., Ltd.) was formed in 1873.

1874 saw Queensland, South Australia, New South Wales and Western Australia all initiating the new industry, New South Wales affording liberal assistance to sericulturalists.

In Queensland, about 1874–5, great results were expected from sericulture, but again all efforts resulted in failure.

During the period 1869–74 the Agricultural Society of New South Wales published information and offered prizes for silk.

Messrs. Affleck and Howard carried on extensive operations at Lavington, near Albury, during 1880–3, but again disaster was the result; various troubles were encountered during the first two years, and in the third pebrine broke out and the worms were decimated by disease, and another chapter of Australia's sericultural history was closed.

About this time Messrs. Thos. S. Mort, H. Prince, Geo. Thorne, Jas. Manning, R. D. Adams, K. Fry and Dr. G. Bennett were in the forefront in their efforts to encourage the industry. Mr. G. Thorne and his daughter, during 1883–7, reared silkworms at Rose Bay, and later at Castle Hill.

In 1892 "New Italy" was founded by the Marquis de Ray's New Ireland emigrants, who took up selections in the County of Richmond, 8 miles from South

Woodburn. Silk-culture was commenced on a large scale; settlers were given considerable financial assistance by the Government, and 25–30,000 mulberry trees were planted; the scheme was carried on enthusiastically for a few years but once again failure ensued.

About 1893 both Queensland and New South Wales attempted to revive the industry, and everything was done to make all possible information available. The Government of New South Wales appointed a salaried expert (Mr. Brady) to advise enquirers. A farm was established at Booral near Stroud and it was advised that a limited number of students would be received for general instruction in sericulture, but it is not known with what success, for beyond the year 1894 no further reference can be found to sericulture in the official publications. The conclusion is only too obvious.

Subsequent to 1894 various attempts seem to have been made by newspapers and the Silk Association to revive and encourage the industry, but all without result.

The history of sericulture in Queensland, Victoria, South Australia, Western Australia and Tasmania follows similar lines, and it will serve no useful purpose to go into it in detail; it will suffice to say that, as in the case of New South Wales, it is a melancholy recital of failure. In a letter from the Assistant Entomologist, Department of Agriculture, Queensland, 31.5.30., he states that no attempts are being made to establish the silk industry in Queensland.

CONCLUSION.

In conclusion the following extract from an article by Mrs. J. South, entitled "Silkworms and How to Rear Them", (*Qld. Agric. Journ.*, 1908), appears to sum up the position with regard to sericulture in Australia. "Some time ago, to prevent disappointment, the Department of Agriculture emphasized the fact that the profits of silk culture are always small, and that the elements of successful prosecution of the industry in this State were then (1893) entirely wanting, and it was only recommended as a pleasant adjunct to the ordinary occupations of the farm, finding employment for those of the farmers' households not otherwise remuneratively employed. The want of a ready market for cocoons was then one of the chief drawbacks to any extended enterprise in cocoon raising. Until, therefore, the creation by the establishment of silk-reeling factories or an export trade, of a profitable market for cocoons, intending sericulturalists were earnestly advised to limit their operations. Coming to the present day, conditions have not materially changed, as owing to labour conditions such an industry could not be carried out by young people on the farm."

Campbell states again: "The real difficulty of establishing sericulture is the fact, remarkable as it is, that in no part of the British Dominions are the English people, or ever have been, in any place, acquainted with the occupation of silk raising as a productive pursuit. Nowhere is there to be found that traditional training by father to son and mother to daughter, which ensures the best of all knowledge in a craft which comes and grows from childhood upwards with the practical experiences of everyday life."

Since 1916 a committee of experts has been sitting at the Imperial Institution to study the possibilities of sericulture in all parts of the Empire, but no findings appear to have yet been made available.

Reviews

THE CULT OF THE GOLDFISH. By T. C. Roughley, F.R.Z.S. (Angus & Robertson, Ltd., Sydney. Published April 19, 1933.) 8vo., pp. xiii + 146, coloured frontispiece and pls. i-xxviii. Price: 6/-.

This book relates, in non-technical language, everything the aquarist is likely to want to know about goldfish. Their shapes and varieties, feeding and breeding habits are described, and their requirements in captivity, either indoors or in garden pools, are fully detailed. Excellent illustrations, mostly from Mr. Roughley's expert pencil and camera, adorn the text and facilitate recognition of the fishes, plants, snails, and other objects depicted. A notable feature of the book is the careful attention which has been given to the tiny crustacea or water fleas, insects and other minute forms of life, some of which are harmless or even useful as fish food, while others are destructive pests, attacking the goldfish. The amateur harassed by the mortality of his pets will derive much help and sound advice from the valuable chapters on pests and diseases and the table of symptoms and treatment.

"The Cult of the Goldfish" may be highly recommended.

GOLDFISH IN AUSTRALIA. By W. Jno. Baker, B.Sc. (Graham Publishing Co., Sydney, April, 1933). 4to., pp. 64, coloured frontispiece and many line illustrations. Price: 2/6.

This work is designed to assist the aquarist tyro in the subject of aquarium keeping. Though the goldfish and its varieties are dealt with in a comprehensive manner, many other aspects of interest to the aquarist are included. Thus the titles of the chapters give some idea of the contents: The Selection of Your Tank, The Aeration of the Water, The Capacity of Your Tank, Varieties of Goldfish, placing the Aquarium, Water Plants, Planting the Aquarium . . . Ponds and Water Gardens, Diseases, and Fish Enemies. Abbreviated Aquarium Aids, a list of books and societies, and a full index are very useful features. This work, besides being written in an easily comprehensible manner, is well illustrated by C. Pearl Gibson, and reflects much credit on author and publishers.

THE HEAVIEST TAILOR: A RECORD FISH.

Authentic records of the length and weight of large fishes, apart from acting as incentives to the acquisitive and competitive instincts of big game fishermen, are always of scientific interest.

The Museum has just received from Mr. Victor Murray, J.P., a fine Tailor (*Pomatomus pedica*), three feet in length, and weighing 18¾ lb. when bled. This fish was caught at Harrington, New South Wales, whence Mr. Murray had earlier reported a specimen 3 ft. 4 in. long, caught by Mr. Rheuben Perry in September, 1932. Some time ago Mr. Arthur Solomons, of the Amateur Fishermen's Association, showed me a photograph of a 16 lb. Tailor which he had caught at St. George's Basin in January, 1930, the length of the fish being given as 40 inches, and, many years ago, Professor F. McCoy recorded a specimen 3 ft. 2½ in. long, caught in June, 1888, in Victoria, where the species is known as Skipjack.

Thus our Tailor evidently reaches a length of over three feet and a weight of about nineteen pounds, and we are indebted to Mr. Murray for his continued interest and for presenting to the Australian Museum the heaviest known specimen of the Tailor.

G. P. WHITLEY.

Some Household Insect Pests

PART I.

BY ANTHONY MUSGRAVE.

IN Australia during the summer months the householder is often sorely tried by insect pests of every kind, and the entomological staffs of museums and agricultural departments are called upon to answer enquiries as to the identification and control of these noxious insects. The object of this article is to describe some of these pests and to suggest methods for their eradication.

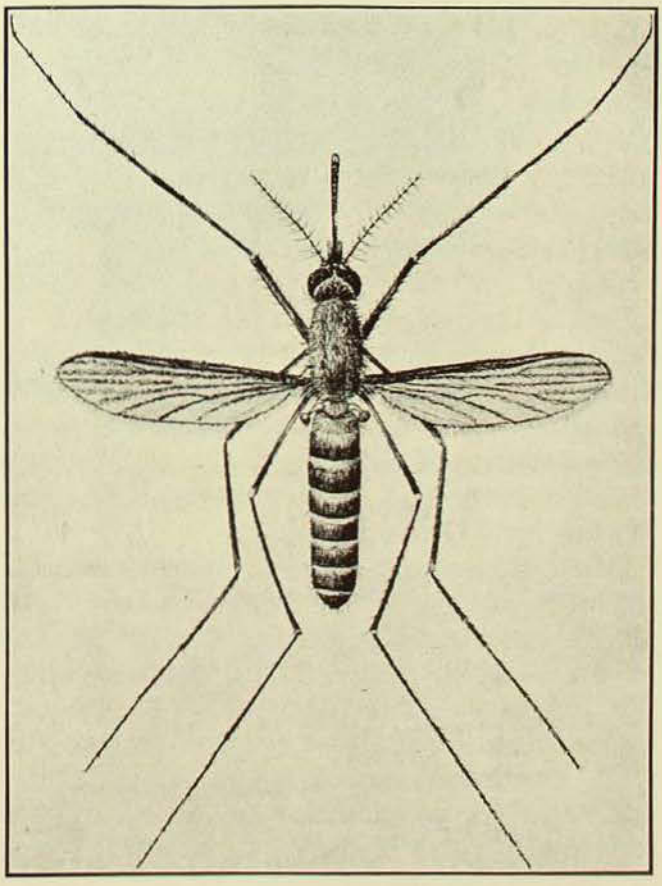
Household pests may be divided into three categories, firstly, those which may annoy or carry disease to the occupants of the house through their bites, of which fleas, bugs, flies and mosquitoes are examples; secondly, those, such as the clothes-moth and silver-fish, which are destructive to household possessions; and lastly, those destructive to foodstuffs, such as cockroaches and ants. Such pests as the powder-post beetle, furniture beetle, and white ants have been dealt with elsewhere by Miss N. B. Adams.[1]

INSECTS WHICH ANNOY OR CARRY DISEASE.

The House Fly.

The House Fly, *Musca domestica*, is too well known to require more than a very brief description. It is dusty-grey in general coloration, with four black longitudinal stripes on the thorax. The abdomen is yellowish in colour, with a median dark stripe. It measures a quarter of an inch in length. The *eggs* are laid in batches of 100 to 150 in manure, garbage, or decaying organic matter. The eggs hatch within twenty-four hours, the time depending on the temperature. The *larvæ* or maggots, are slender, white, legless grubs, which attain a length of half an inch. After five days the larvæ pupate, the *pupæ* being barrel-shaped and dark-brown in colour, and in about a week's time the winged adults appear. Owing to the short life-history several generations may appear during the summer; a single fly has been estimated to give rise to about 125 million descendants during a season. This fly disseminates such diseases as typhoid, tuberculosis, dysentery, and infantile diarrhœa. Breeding in filth it flies to human food, carrying bacteria on its legs and body and in its excreta and regurgitated saliva.

Control.—The proper means of controlling house flies is by reducing their breeding grounds. Dust-bins should be provided with tight-fitting lids, and manure heaps should be treated with kerosene, chloride of lime, powdered borax, or one pound of borax to six gallons of water. Inside the house, wire screens will keep out flies, but those which have been permitted to enter



The House Mosquito, Culex fatigans.
[*After* Patton and Cragg.

[1] Some Wood-destroying Insects, AUSTR. MUS. MAG., iv No. 10, April–June, 1932, p. 337.

may be killed by means of "Tanglefoot" fly papers, "Daisy fly killers," or any of the well-known liquid insecticides which are on the market. One of these latter may be prepared by mixing a half pound of pyrethrum powder to a gallon of kerosene, or substituting paradichlorobenzene for the pyrethrum. This may be used in a hand sprayer. A well-known poison bait for flies consists of one teaspoonful of formalin to a cupful of milk or sweetened water.

Mosquitoes.

About Sydney, particularly towards the end of the summer, mosquitoes annoy sleepers with buzz and bites, while visitors from England or the continent may suffer greatly from their attentions.

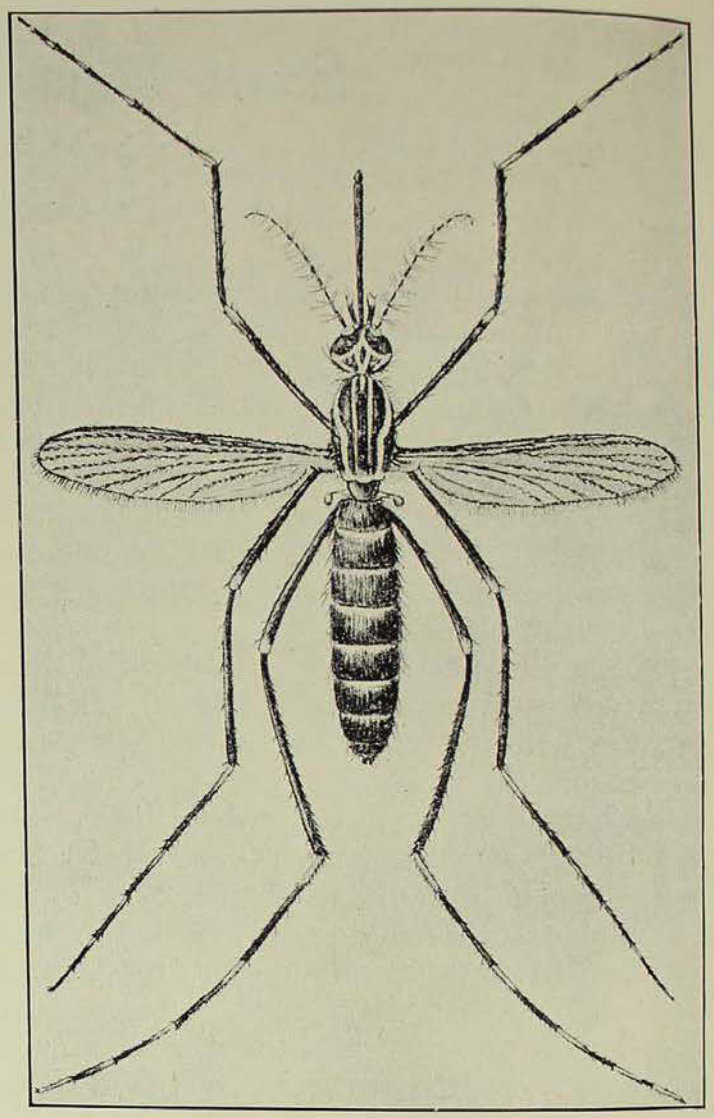
The common house mosquito, *Culex fatigans*, is widely distributed throughout Australia; it is a brownish insect with a banded abdomen, but the legs are not banded. It does not bite during the day.

In and about homes situated along the tidal rivers the small black mosquito, *Aëdes vigilax*, is a very vicious biter. It has white bands on the tarsi. It breeds in mangrove swamps. Another biter to be met with near the salt water is the large Scotch or Hexham Grey, *Mucidus alternans*. The Dengue and Yellow Fever Mosquito, *Aëdes argenteus*, formerly known as *Stegomyia fasciata*, and later *Aëdes ægypti*, does not occur south of Newcastle, New South Wales.

Anopheles mosquitoes are the vectors of malaria, and occur in Victoria and New South Wales as well as tropical Australia.

Though yellow fever has not been recorded from Australia, dengue or break-bone fever, on the other hand, is a common disease in towns in northern New South Wales and Queensland.

Mosquitoes are aquatic during all their juvenile stages. The eggs are laid, either singly or in a mass, on the surface of water or on aquatic plants lying on the surface of the water. The mosquitoes of the genus *Culex* while laying their eggs arrange them with the hind legs so that they form an *egg raft*. A good example of an egg raft of this nature is that furnished by the house mosquito *Culex fatigans*, being boat-shaped and consisting of 200 to 400 eggs. The *Anopheles* mosquitoes deposit their eggs singly. The larvæ or wrigglers emerge from the eggs in from one to three days. They vary in structure in the different genera and have to come to the surface of the water to breathe. The head is followed by a rounded thorax, after which comes the nine-segmented abdomen, the segments diminishing in size posteriorly.



The Yellow Fever Mosquito, Aëdes argenteus (= Stegomyia fasciata).
[*After* Patton and Cragg.

In all mosquito larvæ except those of *Anopheles* there springs from the eighth segment a tube, the *respiratory siphon*, through which air is taken into the body. The larva of *Anopheles* feeds at the surface of the water and lies parallel with it. Mosquito larvæ spend from seven to eight days as "wrigglers," moulting or changing the skin several times before entering the pupal stage. A mosquito pupa takes no food, but jerks about in the water, rising to the surface to breathe. It has a large

head and thorax, the former bearing paired breathing organs. After spending about thirty-six hours in this stage it emerges as an adult mosquito.

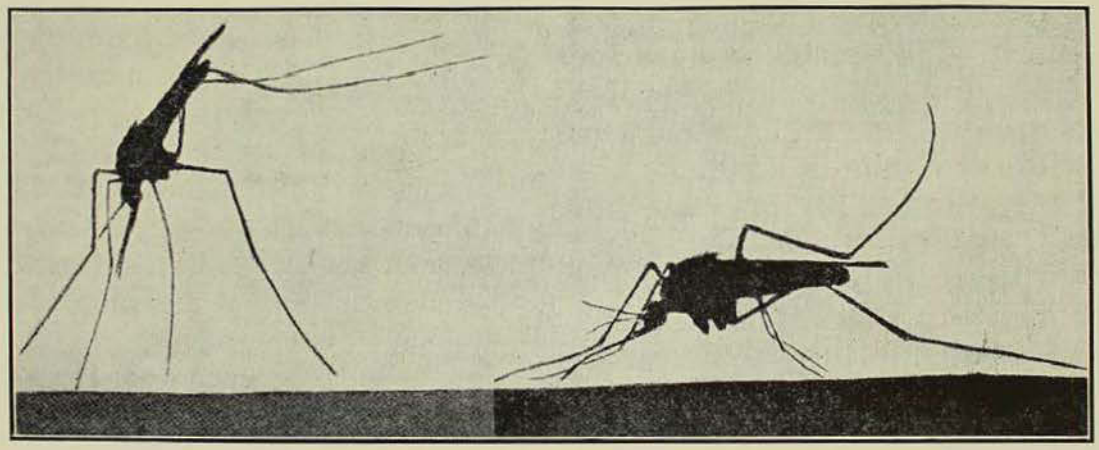
Control.—Knowing something of the life-history of a mosquito we are in a good position to combat it, and as in the case of the house fly, we must fight it through its breeding grounds. Water-tanks should be screened, and any pools in which mosquitoes breed should be treated with kerosene oil or crude petroleum. Receptacles likely to hold water, such as tins and bottles, should be disposed of with house refuse and not permitted to remain where they may serve as breeding grounds. Mosquitoes may be banished from rooms by means of one of the liquid spray mixtures now on the market or the Japanese "Cocksec" coils.

following formula is given to keep away mosquitoes:

Oil of citronella, 1 ounce; spirits of camphor, 1 ounce; oil of cedar, ½ ounce. A few drops may be placed on a towel and hung at the head of the bed.

Another formula given is: 1 ounce of oil of citronella to 4 ounces of liquid petrolatum, which latter retards the evaporation of the citronella. Lanoline has also been suggested as a substitute for the petrolatum, using 20 minims of the oil to the ounce of lanoline.

In a pamphlet issued by the Office of the Director-General of Public Health,[2] New South Wales, is given information about our local mosquitoes, with methods for their control, and the three following mosquito and sandfly repellants.



Resting attitudes of mosquitoes. Left, Anopheles, with body at an angle to surface; right, Culex with body parallel.
[*After* Herms.

Remedies and Repellants.— While mosquito nets are not in general use in Sydney during the summer, as they are in Queensland, nevertheless in some homes they are used.

Oil of citronella and oil of lavender are often employed to keep mosquitoes away so that one may drop off to sleep. The effect of these oils wears off during the night, but the general impression is that if one can get to sleep before the oil has evaporated, then the mosquitoes may take what toll of blood they will.

In an interesting article by Messrs. L. O. Howard and F. C. Bishop[2] the

"1. Eucalyptus oil, 2 ozs.; liquid carbolic acid, 4 drops; citronella oil, 2 ozs. Mix well and put in a bottle with a sprinkler screw-top. *Shake before use.* A few drops should be used on the hands, face and neck before going to bed.

"2. Oil of cassia, 1 oz.; brown oil of camphor, 2 ozs.; 'vaseline,' lanoline, or salad oil, 3 ozs. Mix well and smear on the skin in small quantities before nightfall.

"3. Oil of citronella, 1½ parts; kerosene, 1 part; and castor oil, 3 parts. Shake before use and smear on exposed parts of the skin."

[2] Mosquito Remedies and Preventives, *U.S. Dept. Agric.* Farmer's Bulletin, No. 1570, 1928.

[3] Mosquitoes: How to get rid of them, Form No. 391 Sydney, 1926.

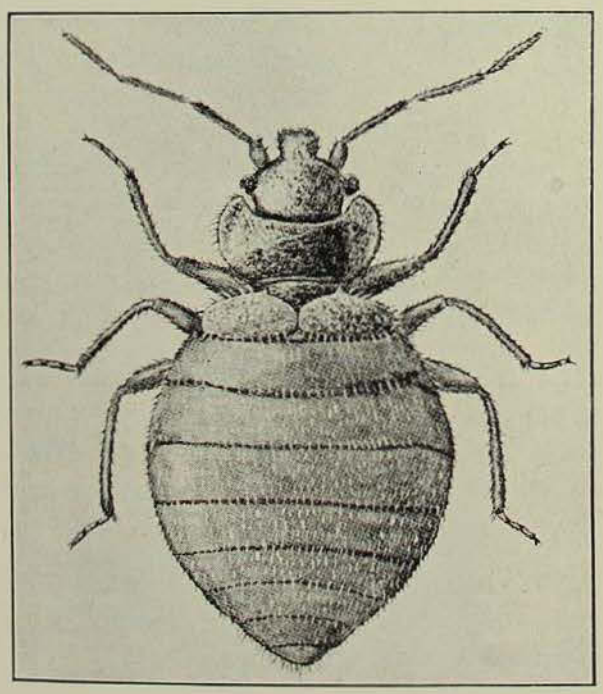
This pamphlet also points out that "scratching the bites of mosquitoes and sandflies may lead to sores," but "cold cream, baking soda solution, ammonia solution (cloudy ammonia), or tincture of iodine" should be applied to alleviate the irritation.

Sandflies.

Less widely distributed are the sandflies, as these seem to remain within a short distance of the salt water. The tidal rivers about Sydney and along the coast are their homes, and on the upper reaches of Port Jackson, Middle Harbour, Botany Bay and Port Hacking they are commonly to be met with during the summer months. Their small size permits them to bite undetected, though the itchy hives which ensue may persist for about a week.

Bugs.

The bed bug, *Cimex lectularius*, euphemistically termed a "B flat," is an insect well-known to everybody. In the adult stage it is an oval, flat, reddish-brown insect, devoid of wings and measuring nearly a quarter of an inch in length. The mouth parts are adapted for piercing and sucking, and they are very partial to human blood. They are nocturnal feeders, and hide during the day in crevices in wooden walls, behind skirting boards, in bedsteads, and under wall paper. Their objectionable odour, which is resented by many people far more than their bites, is secreted by glands. Odd specimens may be picked up in railway carriages, theatres, and similar places where humans congregate, but they usually occur in old wooden houses, hotels and boarding-houses where people are constantly arriving and departing. The small white eggs are laid in the crannies in which they live. These hatch in from seven to ten days, and the adult condition is reached in about four to seven weeks, the period being determined by the warmth of their surroundings.



The Bed-bug, Cimex lectularius.
[*After* Patton and Cragg.

The Indian Rat Flea (Xenopsylla cheopis), the rat flea of the tropics.
[Photo.—*R. Grant.*

Control.—Fumigation by means of hydrocyanic acid gas is the best means of eradicating this noisome pest, but this work should be placed in the hands of an expert.

Fleas.

The tiny, wingless, laterally-compressed insects which are grouped in the order Aphaniptera are popularly termed fleas, or vie with the bed bug for musical honours by being politely termed "F sharps." Their powerful legs enable them to leap and so evade capture, and they are also very active when amongst the hair of dogs and cats. The mouth parts are in the form of a piercing organ by means of which they are able to suck up the blood on which they feed. The bite of a flea may produce large itchy raised areas on the sensitive skins of some people, while others suffer no ill effects. The Cat Flea, *Ctenocephalus felis*, and the Dog Flea, *Ctenocephalus canis*, readily attack man.

Fleas lay their white oval eggs among the hairs of their hosts or in the places where they sleep. Those laid on the animals fall to the ground and the larvæ on emergence live in the floor cracks or among the dust under carpets. They later spin cocoons in which they pass their pupal stage, emerging as adult fleas. Fleas are the vectors of bubonic plague, though the Indian Rat Flea is regarded as the chief carrier of the disease.

Control.—Fleas in a house can usually be traced to the presence of dogs or cats, so that these pets require to be washed and every care taken to keep them and their sleeping quarters free from the pest. Messrs. Gibson and Twinn have suggested[4] washing these animals in a solution of creolin, two per cent. for cats, and three per cent. for dogs, to be followed by soap and warm water. Sometimes it may be found necessary, when the insects occur in great numbers in a house, to use hydrocyanic acid gas. The cracks in floors should be kept free from dust, and rooms periodically scrubbed with soap and hot water.

[4] Arthur Gibson and C. R. Twinn.—"Household Insects and Their Control", *Dept. of Agric., Ottawa, Canada*, Bull. No. 112, n.s., June, 1929, pp. 1-84, illustr.

Obituaries

CLIVE E. LORD, F.L.S.

The news that Clive Errol Lord, Director of the Tasmanian Museum, Hobart, died on July 15 will be received with surprise and regret. He was born in Hobart in 1889, and was therefore in the very prime of life, with apparently many years of activity in front of him.

A man of wide knowledge and abounding energy, he played an important part in scientific and allied organizations in his native State. Apart from being Director of the Tasmanian Museum, he was also Commissioner of Fisheries, Secretary of the Royal Society of Tasmania, Honorary Secretary of the Tasmanian Field Naturalists' Club, member of the National Park Trust, and last year he was President of the Royal Australasian Ornithologists' Union. In spite of these duties, he found time to contribute to scientific literature, especially the vertebrates of Tasmania. He was joint author with Mr. H. H. Scott, of the Queen Victoria Museum, Launceston, of an important series of papers on Tasmanian mammals published by the Royal Society of Tasmania, and the two friends collaborated in a comprehensive work *A Synopsis of the Vertebrate Animals of Tasmania.*

We mourn his loss, not only as that of an accomplished naturalist cut off in the midst of his career, but as that of a valued and generous friend. C.A.

CHARLES FRENCH, SR.

The death of Charles French, Sr., the first Government Entomologist of Victoria, on May 21, 1933, in Melbourne, Victoria, severs a link with the past.

He was born at Lewisham, Kent, England, on September 10, 1840, and arrived in Australia on April 6, 1852. From 1857-1862 he was engaged as a nurseryman, and in 1865 he entered the Victorian Government Service as assistant in the Botanical Branch of the Chief Secretary's Department. In 1881 he was appointed Custodian of the Botanical Museum, and in 1889 he was appointed Government Entomologist, from which post he retired on June 30, 1911, to be succeeded by his son Charles French, Jr. He was the last of the foundation members of the Field Naturalists' Club of Victoria, inaugurated in 1880. His *Handbook of the Destructive Insects of Victoria,* Parts i-v, 1891-1911, is regarded as his crowning achievement, but he will long be remembered for his ever ready help to the beginner in entomology, most of the older Victorian workers in entomology gratefully acknowledging their indebtedness to him, whom they had come to regard as the founder of entomology in their State. A.M.

Through Tropic Queensland

by

A. J. MARSHALL, R.A.O.U.

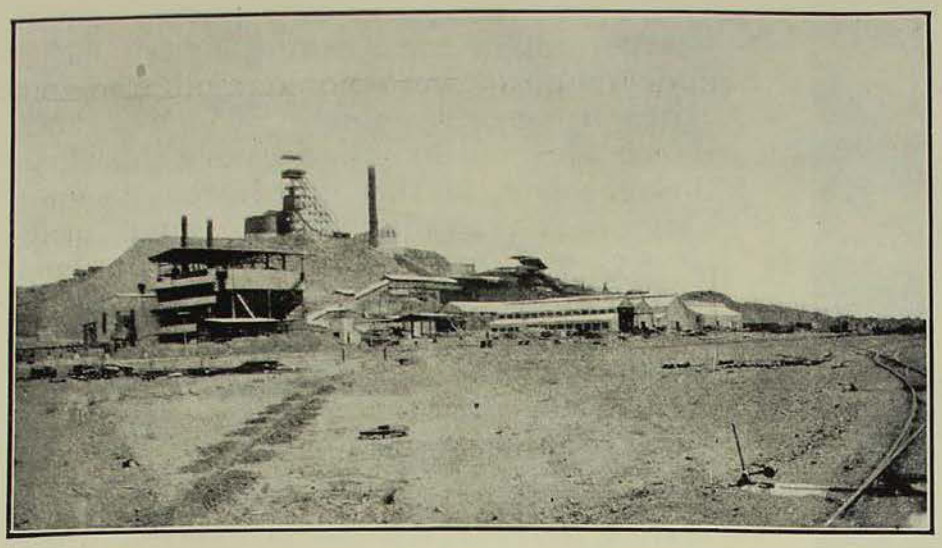
An extensive canefield in the Innisfail district. Travelling through the north one becomes accustomed to the vast areas of waving greenness, whilst in many places a cloud-capped jungle-mantled mountain range makes a picturesque background.

[Photo.—*A. J. Marshall.*

I WENT to Queensland in search of a "lost" bird, a puzzling species which, described from a battered and unsexed skin a quarter of a century ago, has since remained unknown, even though it has been sought for by some of Australia's leading ornithologists. Not so strange to relate, I did not get my bird, but, during the three months in which I was travelling in that tropical wonderland, I learnt much of its feathered inhabitants, and something, moreover, of the magnitude and grandeur of the far north—the garden of Australia.

Unfortunately for the naturalist, the north is rapidly becoming settled. Vast areas, once the retreat of some of our loveliest birds and mammals, are being planted with sugar cane, and, to a lesser extent, with tobacco and other crops.

Many years ago the whole of this fertile cane-country was clothed with a luxuriant growth of tropical scrub, in which wallabies, bandicoots and possums reigned supreme. Gorgeously-plumaged Rifle-Birds, rainbow-hued Fruit-Pigeons, several species of Bower-Birds, and the great Cassowary lived in peaceful seclusion, amply protected by flesh-scoring vines, spiny palms, and a formidable variety of stinging trees and nettles. But now, yard by yard, the jungle growth is being felled, and the rich soil planted with cane. In some places even the scrub-mantled hillsides are being denuded of vegetation to make room for a plantation and a settler's humpy. Satisfactorily to observe our vanishing fauna and flora, in many districts one must travel far from the railway, but this state of affairs is atoned for somewhat by the vast expanses of waving greenness, which, when viewed against a jungle-clad, cloud-capped, tropical mountain, presents an unforgettable scene.



The mines and huge lead smelters at Mount Isa work day and night throughout the week. The lead ingots are railed 600 miles to Townsville, whence they are shipped to various parts of the world.

[Photo.—*A. J. Marshall.*

A WESTERN OASIS.

In western Queensland, not so far from the Tropic of Capricorn, there lies a small swamp: a picturesque patch of verdancy set amid a vast and sombre expanse. This tiny oasis, the only one for many miles, is the haunt of many interesting creatures. Spreading coolibahs surround the swamp, making it a shady haven on even the hottest of western days, whilst the interior is clothed with shoulder-high reeds and the margins with luscious grass of an amazing greenness.

Upon leaving camp on the first of my five days' sojourn at this delightful spot, I at once noticed that the bulk of the avian population were recognized nomads. Plovers protested at my intrusion, and Egrets, White-necked Herons, Straw-necked and White Ibis all croaked resentfully as they lazily flapped their way across the waving greenness to a more secluded portion of the swamp. Plump little Red-kneed Dotterels watched me warily from an adjacent sandspit, and a flock of Brolgas, feeding among a belt of gidgee trees, uttered plaintive warning cries as they ponderously "took off" at my close approach. Sacred Kingfishers, Pallid Cuckoos, Trillers, and other recognized migrants were also present.

It was my custom each morning to rise at the first streaks of dawn, but even before daylight I invariably found flies already on the move; in fact, they on more than one occasion awakened me. So vigilant were the plovers that on only one occasion did I reach the reed-beds without being assailed by a metallic chorus from the flats; on that occasion, I found the swamp to be peopled by some twenty White-eyed Ducks, fifty "Straw-necks", thirty Glossy Ibis, and odd White Ibis, Egrets, and Herons, all feeding quietly as if confident of the plovers' powers of observation. Galahs in thousands were screeching as they perched in the coolibahs and gidgees waiting to drink and bathe, and a hundred yards further up-swamp a cloud of them were fluttering and quarrelling over a small and apparently favoured pool.

Sunrise was heralded by a pink glow among the coolibahs toward the east; the glow slowly extended, until the whole eastern horizon assumed a rose-lilac opalescence; previously bluish, the clouds in the immediate foreground became ablaze with a rosy flame. Slowly the great golden sphere arose, shedding its brilliance over the clouds, skies and swamp, whilst the grey and the rose of the galahs alternatively flashed in the sunlight as they departed in great flocks for their feeding grounds—the great open and sparsely timbered plain-lands.

A solitary White-headed Stilt arrived from down-swamp and flew to a small grass-fringed pool close by. What a picture it presented in the morning sunshine, the glistening white underparts, dark back and wings, long bill and pink stilt-like legs all perfectly reproduced in the pellucid water below! The Stilt moved with its abnormally long legs slightly bent, darting its correspondingly

The jungle-clad slopes adjacent to the Barron Gorge, north Queensland. Here, as on Bellenden Ker Range, Bartle Frere, and other peaks, scores of interesting birds and mammals find safe and congenial haunts.

[Photo.—*A. J. Marshall.*

elongated neck into the water and ooze to capture some luckless aquatic organism.

Each evening at dusk grey and red kangaroos came to drink—big fellows, which hopped cautiously towards the water as if fearful of attack. I noticed on several occasions that a "red" and a "grey" were apparently mated, and often a small red "joey" was observed hopping quietly along with his diversely clad parents.

THE GREAT PLAINS.

Animal-life was at a minimum on the great rolling plains of the north-west. Crossing the wide and, in many places, waterless downs between the two railways, Charleville to Blackall, it was not quite so bad; grass-hoppers, small lizards, and a few Ground Larks, Quail and Bustards were noted amid the dry Mitchell grass upon which those thousands of hardy western merinos thrive. But farther north the drought king held complete sway, and practically nothing but dust, stones, and barren outcrops could be seen. Sometimes, though, an occasional spot of green was visible, usually a patch of galvanized, or other variety of burr—hardy, noxious plants which even drought cannot conquer.

Here half-starved kangaroos would oft-times be seen. The sheep were dying in hundreds. A remarkable variety of skeletons was always on view throughout these parched expanses; those of cattle, sheep, and horses were commonest, with a fair sprinkling of kangaroo bones, and occasionally those of bustards, emus and other birds. Presumably lack of water was responsible in the majority of instances for these gruesome relics.

Mirages were always to be seen, usually in the form of water. Delightful coolibah-fringed pools would appear a few hundred yards along the road ahead, to the rear, and often far out on the plains to each side. Woe betide the luckless individual, who, desperately short of water, wanders from the tortuous sun-baked road in pursuit of a mirage!

Even when one is travelling by car, with a plenitude of cool liquid always at hand, the mirages are still tantalizingly persistent.

In this country there are many well-grown children who have yet to see *real* rain! Yet, what a difference when finally good rain falls! The downs rapidly become clothed with waving grasses, birds and mammals become plentiful again, and once more the price of stock soars. But always remain those grim roadside exhibits, reminders of the past, and perpetual warnings for the future! The heat in February and March was terrific, but a mere 115° in the shade was not considered extraordinary by the plain-dwellers.

THE LEICHHARDT RIVER.

In 1844-45 the German explorer, Dr. Ludwig Leichhardt, traversed this country and crossed the river now known by his name. He thought it was the Albert River, but A. C. Gregory in 1855 rectified the error and bestowed Leichhardt's name upon it. The country even to this day, almost ninety years later, is in most places as wild as when the intrepid German passed through.

The low red ranges adjacent to the watercourse are partially clothed with coarse spinifex grass (*Trioda irritans*), and a stunted variety of eucalypt. Practically no bird-life was observed; in fact, I was rarely able to secure even insects, so barren and lifeless was the surrounding country. Termites' mounds, however, were sometimes observed.

The river bed was surprisingly well timbered, and birds of many varieties revelled amid the honey-laden insect-attracting blossoms on tree and shrub. Honey-eaters of several species were noted, also nectar-loving parrots, as well as Peewees, Magpies, Trillers, Peaceful Doves, and many other familiar southerners. Black-tailed Tree-creepers, Golden-backed Honey-eaters, Cloncurry Parrots, and a Masked Owl were among the "rarities" noted. Only at very irregular intervals along the sandy river-bed did water occur, and then only in very limited quantities. This, however, usually seemed quite sufficient to attract goodly numbers of Black-fronted and Red-kneed Dotterels, White-faced and White-necked Herons, and Black Ducks.

The huge lead-smelters at Mount Isa are perched on the sides of the range above the railway yards; the town, mostly iron houses and wooden stores, is directly across the river. Mount Isa is the terminus of the Great Northern Railway, and is over six hundred miles from the coast, and only about eighty miles as the crow flies from the Northern Territory border.

JUNGLE DAYS.

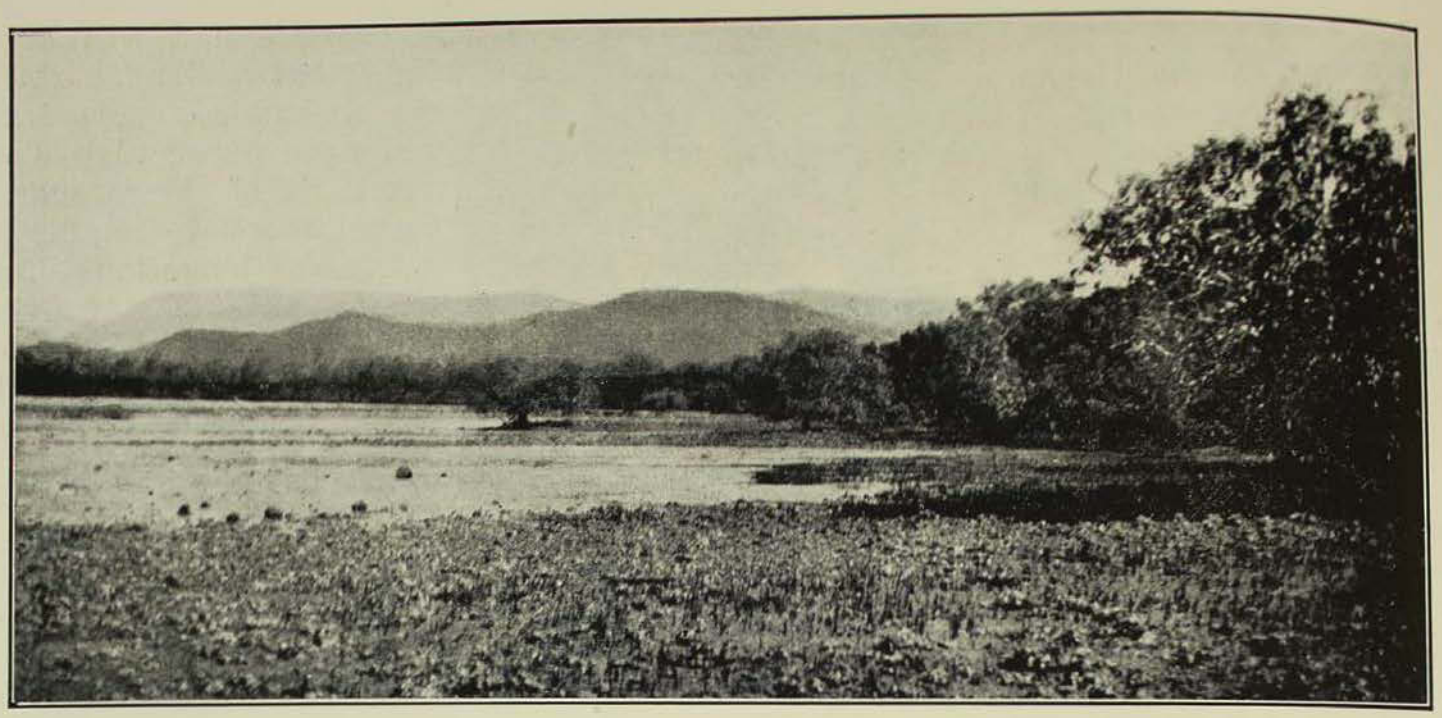
It is a far cry from the sun-baked Leichhardt River country to the tropical jungles of the coast, and I will never forget the delight that was mine when, after a tedious six-hundred mile train journey, I gazed upon those vast scrub areas so characteristic of the far north. No more, I reflected, the sickening hordes of flies, the swarms of ubiquitous black ants, or the pitiful spectacle of dying stock. Instead, the verdant jungles, sparkling cascades, waving canefields, and *real grass*. How strange-seeming

Twixt mangroves and jungle in the Rockingham Bay district. "Avenues" such as this invariably exist between the coastal mangroves and the jungle-clad shore.

[Photo.—*A. J. Marshall.*

were these extensive grass-lands, after a month or two "outback". It appeared incongruous in the extreme that only a few hundred miles over the range were countless thousands of starving sheep.

Very few southerners have any true conception of the "big-scrubs" of north Queensland. The floral diversity of the northern brushes is remarkable; the avifauna of the region, too, is extremely diversified, including as it does some of the most primitive of birds, such as the Cassowary, as well as such species as the Rifle-Birds, the Manucode, and the Black



Mud flats and mountains in the Cardwell district. The mangrove swamps are a rich collecting ground for the naturalist, and it is difficult to resist such an attraction despite mosquitoes, sandflies and a stray crocodile or two.

[Photo.—*A. J. Marshall.*

Butcher-Bird, which occupy very eminent positions on the avifaunal ladder. There is a surprise awaiting the southerner around every corner. For example, after studying the White Ibis in the open sun-lit swamps of the Riverina, who would associate it with the sunless brushes of the tropics? Yet in every swampy portion of the scrubs one is almost certain to flush a White Ibis. I will ever remember the regret felt when I first heard the call of the delightfully coloured Blue-winged Kookaburra, the tropical cousin of our own familiar "Laughing Jack". Far surpassing in beauty his southern relative, he of the blue wing possesses not the attractive guffaw of the southern bird; instead, he emits a most blatant yell, quite out of keeping with his magnificent appearance.

Mangos, custard apples, guavas, paw-paws, and coconuts grow wild in the streets and paddocks of the northern townships. The exquisitely perfumed frangi-panni flourishes everywhere, as do also hibiscus and many other beautiful shrubs and flowers. How the dainty Sun-Bird and the numerous nectar-loving lorikeets and honey-birds revel among the wealth of blossoms! In the depths of the scrub one sometimes finds orchid-festooned tea-tree swamps. Here we find a great variety of honey-loving species disporting themselves among the white flowers. The vivid scarlet raiment of the "Blood-Bird" appears particularly attractive against the snowy blooms, but its joyous lilting seems strangely out of place to one accustomed to hear it in Sydney's shale lands.

But all memories of the jungles are not pleasant ones. I remember stalking a particularly elusive Chowchilla through a riot of stinging trees, lawyer vines, spiny palms, and other unpleasant growths, when a frond I brushed came in contact with the pendent nest of a particularly vicious brand of black and yellow wasps. I would never have imagined it possible for a human being to progress through such scrub in so short a time! I finished up minus my shirt and part of my shorts, and plus several painful stings and many raw patches due to violent contact with malignant jungle growths. Leeches were embarrassingly numerous, and venomous snakes were in fair numbers. Though not to be included in the latter category, the gigantic North Queensland Rock Python, as well as its smaller relative the Carpet Snake, were also noted. One

decapitated python I examined on the Tableland railway line was at least fifteen feet in length.

But many were the compensations for such unpleasantries as snakes, leeches, and wasps. In particular I might mention the discovery of the nest and young of the tiny Large-billed Warbler (*Gerygone magnirostris*), a species known to relatively few ornithologists. The pendulous swaying home of this sombre-clad sprite was discovered suspended in a flowering tea-tree growing by a lily-bedecked pool at the fringe of the scrub. The nest contained several young, which squeaked lustily whenever the female approached with food. She was most assiduous in her attention to the young, whereas the male came only at irregular intervals to feed the babies. The song of the "Large-bill" I found to be very beautiful: a succession of descending double liquid notes, suddenly changing to a series of lilting triple notes, sometimes followed by a low musical chatter. Yet a pioneering ornithologist has described the song of this bird as an "extremely weak twitter".

THE COASTAL SWAMPS.

How exceptionally diversified can even the smallest stretch of far northern coastline be! Within an area of half a mile, one may sometimes discover an interesting mangrove swamp, a mud-flat teeming with both marine and bird life, a delightful sandy beach, and an extensive area of frowning weed and mollusc-clad rocks. Often a small distance inland, shallow though large salt-water lakes will be found, the temporary haunt of myriads of the small migratory waders, and the more permanent feeding grounds of thousands of the larger local wading birds. Sunset each evening presented a remarkable sight, countless egrets, herons, ibis and other species flying silently and steadily inland, singly, in pairs, in dozens, and in hundreds. If I remained motionless, those approaching in my direction would fly straight across, some at a great height, but the majority low enough for me to perceive the yellow bills of the egrets, the straw necks of the ibises, and the spotted necks of some of the White-necked Herons.

If, however, I incautiously moved, "my" section of the contingent would swerve sharply across to one side. The birds kept going across until dusk.

"Where do they go?" I inquired of a local resident. "Inland, a bit, to roost", he replied, in that delightfully brief, if vague, manner of the north. At the sandy and sparsely weeded lake margins, Asiatic waders of many species abounded, all in their sombre migration plumage, which renders specific identification difficult. Whimbrels, Stints, Greenshanks and Curlew-Sandpipers, were noted, some in vast flocks and others in pairs or small parties. Stilts of the same species as those previously noted in that delightful western oasis, were here found courting their chaste reflections in the salt-water coastal lakes.

Large areas of tall cane-grass skirt the salt lakes, and amid the grasses safe and congenial homes are found by the Tawny and Little Grassbirds, various species of finches and that huge non-parasitic Cuckoo, the Pheasant Coucal. The low vibrant drumming of this singular bird may always be heard in the north. When flushed from the reeds or grasses, it flies with a heavy lumbering flight some fifty yards or so and once more seeks refuge in the grass.

On a grassy plain just a few miles inland a flock of approximately three hundred Brolgas (Native Companions) were feeding. The car approached within forty yards of the nearest birds before they stalked away in that calm dignified manner peculiar to the species.

AMONG THE MANGROVES.

There is a peculiar fascination about a mangrove swamp. To the marine zoologist the mangroves have ever provided an inexhaustible field for study, and to the student of birds, also, these apparently drab areas offer endless opportunities, harbouring, as they do, some of the most

winsome and distinctive of our tropical avian population.

I count some of my "mangrove rambles" in the far-off Cardwell district among the real high-spots of my northern experiences. Perhaps the presence of the dreaded Estuarine Crocodile lent added zest to the rambles, but what ornithologist could see such intriguing species as the Black Butcher-Bird (brown phase), Mangrove Kingfisher, Mangrove Robin, Broad-billed Flycatcher, and the several species of golden-voiced Honey-eaters, which visit the mangroves in search of nectar and insects, without feeling exhilarated?

My note-book, dated late in March, reads as follows: "Mangroves, dense and high, with tall and spreading roots, skirt the shore further along the bay, and these in turn are flanked by belts of low scrub intersected by mangrove-lined creeks. At the fringe of the mangroves I halted and whistled. A couple of Yellow Honey-eaters came immediately and stayed peering at me whilst I continued to call; a Sunbird next flashed up, a little beauty, who inspected me from a distance, and then dashed disappointedly away. A Yellow-spotted Honey-eater—the 'Jacky' of Beachcomber Banfield of neighbouring Dunk Island—also arrived, as well as a bevy of Dusky Honey-eaters, some Brown Honey-eaters, and a saffron-breasted Northern Yellow Robin.

"I heard a beautiful, though somewhat mournful note, once repeated, come from the depths of the mangrove swamp, so, just on chance, I offered a speculative whistle. To my delight a Mangrove Robin flew silently up, and perched within a few feet of my face. I would have been quite unaware of its presence had I not been facing the direction from which it appeared. It has the familiar Yellow Robin's trick of sitting quietly and almost motionless on a bough, though this fellow flutters his wings at times. It remained silent during its stay with me, though I did my best to provoke it to further vocal effort."

Sand-flies and mosquitoes were in millions, but the results of my visits into the mangroves always convinced me that they were well worth any such slight inconveniences. In the scrub and among the cane-grass behind the mangroves, I frequently flushed Wallabies,* large reddish fellows with white underparts, which bounded away at my approach, sometimes directly through the jungle, though often escaping by way of the mangrove swamps.

The butterflies, large, multi-hued beauties, floating languidly from blossom to blossom, were a never-ending source of delight. Each night the fireflies came out and moved eerily through the vegetation, whilst the mournful, yet not unbeautiful, call of a night-bird invariably came from the swamps. It was on such nights as these, with a huge saffron moon riding serenely across the darkened waters and adjacent islands, that I would lie before the camp-fire and pack specimens, write home-letters, and make notes on the day's work.

* Probably the Agile Wallaby (*Macropus agilis*).

In the last issue of this MAGAZINE Mr. W. Boardman contributed an article upon leeches. Several readers who have lived or been occupied in leech infested districts have written to express their appreciation of this contribution. One, a surveyor, says that he obtained immunity from attack by freely lathering the parts of the body exposed to attack with common laundry soap. He further intimates that he has heard that smearing with eucalyptus oil or carbolic compounds has proved efficacious.