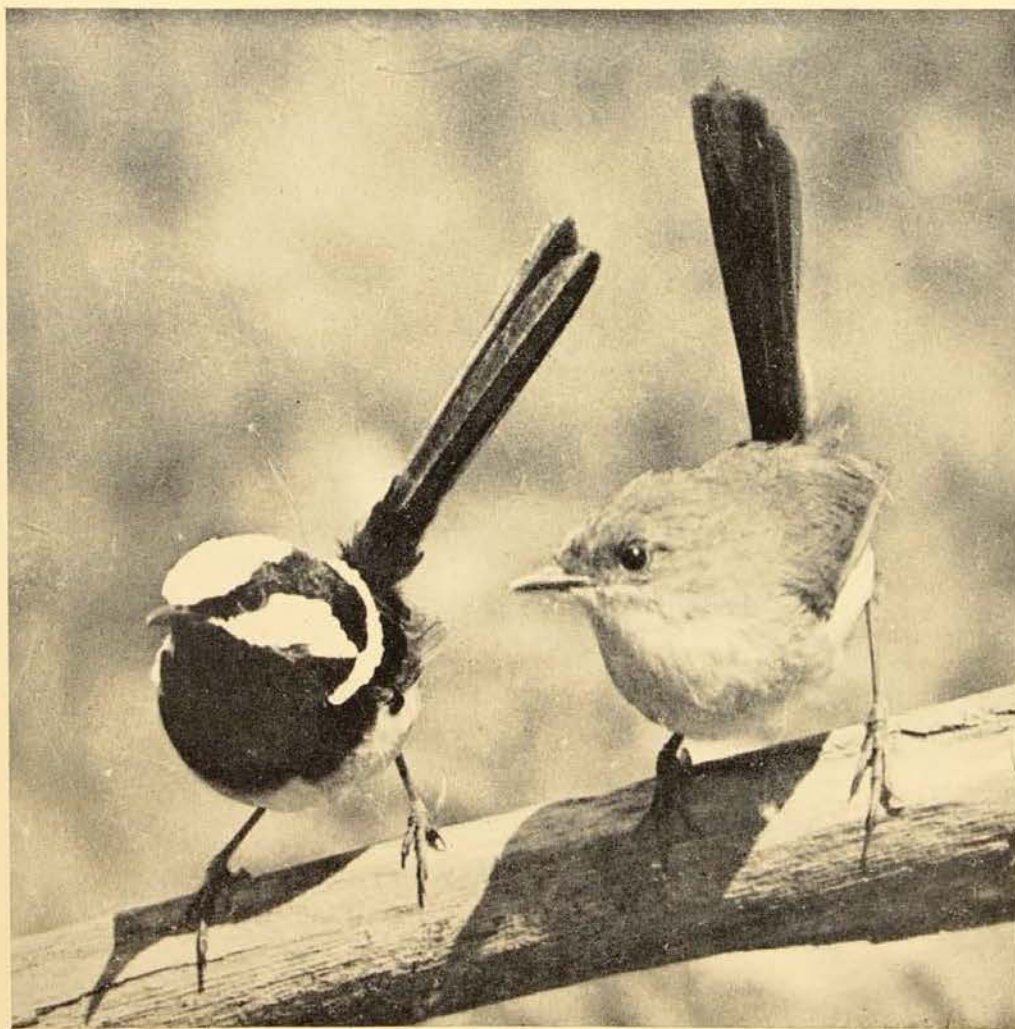


*The*  
AUSTRALIAN  
MUSEUM  
MAGAZINE

Vol. X, No. 9

Price—TWO SHILLINGS



Blue Wrens.



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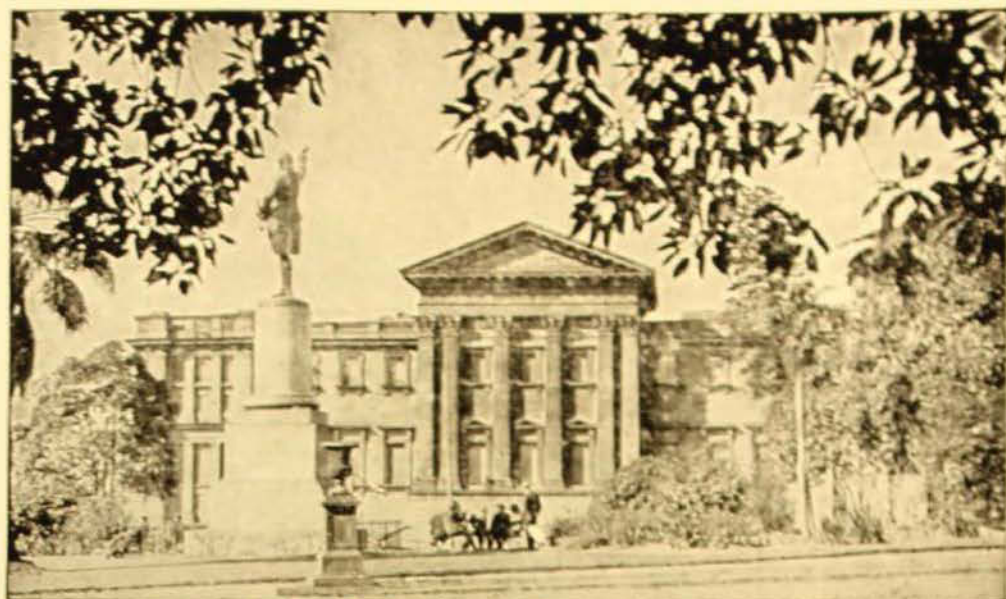
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(Photography, unless otherwise stated, is by Howard Hughes.)

● OUR FRONT COVER. Blue Wrens are amongst the most attractive and best-known of our native birds. In addition to the vivid blue of the male their charm, in no small measure, lies in the readiness with which they adapt themselves to suburban gardens. They are both tame and noisy and one wonders how they can avoid cats: this they do very successfully for they are most alert and, preferring to move in small parties, are quick to warn each other of impending danger.





The "Devil's" brood: a mother and three young. One of the earliest pouched mammals observed in "Van Diemen's Land", its black coat and fierce appearance earned the uncomplimentary title of "Tasmanian Devil". Adults are naturally pugnacious in defence, but avoid humans, while mother and father have a mutual nest-building instinct. The mother became docile in captivity, while the youngsters made playful, cleanly, and amusing pets.

Photo.—David Fleay.



# THE AUSTRALIAN MUSEUM MAGAZINE

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March 15, 1952.

## The Tasmanian or Marsupial Devil— Its Habits and Family Life

By DAVID FLEAY, B.Sc., Dip.Ed., C.M.Z.S.

DOWN in the rugged regions of the uninhabited south-west of Tasmania are many fast-running cold streams. They are dark, mysterious, and beloved of the platypus under the overhang of thickly-growing myrtles (*Nothofagus*) and tangled growths of horizontal scrub, *Bauera* and tree fern. Their waters are the colour of milkless tea from percolation through the peat of the "button grass". Along the banks under the dense canopy of foliage run well defined animal pads—twisting here and there between mossy trunks and at times dividing to ascend the butts of fallen tree-giants which span the cold rushing waters. In soft spongy ground the footprints of nocturnal users of these traffic arteries of the wild show plainly. One picks out the bird-like imprints of wallaby feet, the well-impressed foot marks of wombats, the dainty prints of dasyures (Native Cats), and the unmistakable plantigrade impressions of the Tasmanian Devil.

Though I had kept, bred and observed the Marsupial Devil years before, it was along the Erebus River in this part of the Isle of Mountains in the summer of 1945-46 that members of our Thylacine expedition first made personal contact with the "Devil" in the wild, and so experienced the thrill of meeting this extraordinary pouched carnivore in the remote area of its last stronghold on earth. In

a Zoo, one is not likely to be attracted by this sombre and rather forbidding marsupial, about the size of a stocky fox-terrier, because of its ugly out-sized head and jaws, wiry whiskers, and wet and continually sniffing nose, to say nothing of its own peculiar odour, and whining snarls.

Yet, for all that, the Devil is a creature of many entertaining antics and distinctly unusual ways, revealed quite readily when one has gone to the trouble of raising youngsters from babyhood. Moreover, the animal's position as the second largest of living marsupial carnivores—soon possibly to be the largest with the rare Tasmanian "wolf" on the very brink of final disappearance—invests it with a peculiar natural history interest. Personally, I have quite an affection for the ungainly, tough-looking creature, and should you ever "enjoy" the experience (which you probably never will) of watching the antics of baby Devils in your living room at night, you may begin to understand my apparently queer ideas!

It is believed that this strongly built, but rather clumsy "living fossil" lost its grip on the mainland of Australia and eventually disappeared entirely following the introduction of the dingo by an early native race. The Marsupial Devil was outmoded by the efficient wild dog—a member of Nature's modern school of specialised intelligent hunters. Fortunately for





A female Devil yawns widely at disturbance of her daylight slumber. The unusually wide gape and powerful teeth are typical of the larger and rarer Thylacine or "pouched-wolf" of Tasmania, and foreign flesh-eaters such as the hyaena. In disfavour near settlement because of poultry raids, it is a useful scavenger and destroyer of rats, rabbits, and even the aggressive tiger snake.

Photo.—David Fleay.

Natural History neither the dingo nor the European fox ever reached the rugged southern island, and Tasmania is still comparatively rich in marsupials and monotremes, in spite of settlement.

#### FOOD AND HABITS IN THE WILD.

In many ways the Tasmanian Devil occupies the niche in its own island fauna which belongs to the hyaenas of the Old World in their particular sphere. When marsupial "wolves" were in their hey-day it was the Devils that cleaned up the kangaroos and large wallabies after the Thylacine hunters had killed them and devoured their own choice portions. The Devils are also keen hunters, but natural scavengers as well, and no item of food is too insignificant, be it frog, snake, small lizard or decaying flesh, and even large insects are consumed. I have seen them chew up a tough old Muscovy drake, disposing of feathers, feet, viscera and even most of the bill. All is grist that comes to the Devil's mill. It was my wife's discovery, not far from the Collingwood river crossing of the West Coast Road, that Devils actually kill and eat the deadly but sluggish Tasmanian black tiger snake.

Droppings found on animal trails there and later in other localities contained scales, vertebrae and also ribs of these reptiles. Also in the droppings were skins of the friendly and pretty little island lizard (*Lygosoma casuarinae*) and more commonly the fur of their usual prey—the Rufous-bellied wallaby and the island wombat. At a pinch Devils may even make a snack of a creature usually held in extreme distaste by carnivorous mammals and birds of prey—the domestic cat. Mr. A. D. Fergusson, one-time Ranger of Lake St. Clair Reserve, central Tasmania, told me of one old Devil that rushed through his open doorway one winter night and attempted to drag a drowsing cat from the hearth for its supper!

Male Devils being much larger than females weigh from 14 to over 20 lb. while females vary from 10 lb. to 12 lb.

The animal is surely one of the world's noisiest imbibers and when drinking water the "clop-clopping" of the tongue is clearly audible at a distance of 15 to 20 yards. Tape worm infection is common and traces of such parasites are common in droppings found in the bush.



The animals are nocturnal, rarely being seen except as dim shadows in the bush at dusk; but they are fond of emerging occasionally from their hidden lairs to stretch and bask luxuriously in the sunshine. At such times their ears become even redder than usual, possibly associated with the absence of normal sweat glands as typical of marsupials, and the fact that they soon become very hot and uncomfortable.

Fur trappers who still carry on large scale operations during the winters of western Tasmania heartily dislike the snare-despoiling Devil, and often go to extreme lengths to rid a particular area of these animals before the season begins. An old pine shack below the frowning Frenchman Range is still known as the Devil's Camp—thanks to the pitiless work carried out by the first snarers there who poisoned and trapped the unfortunate carnivores so that their whitened bones lay in that vicinity for many years afterwards.

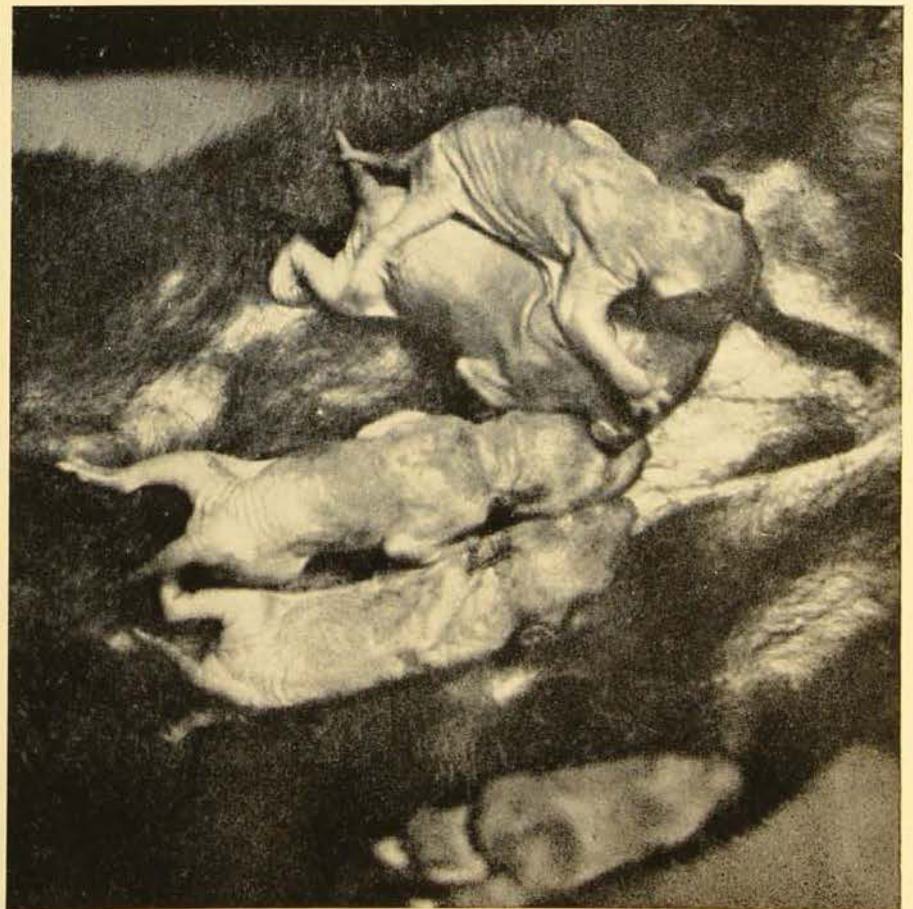
The "drop door" cage traps used by our expedition for securing Devils on the Erebus River and other parts of the south

west were collapsible structures carried in sections to these remote areas by pack horse. They were baited each evening with either parrot, bacon or wallaby meat, and in order to attract our quarry, scent trails were created by dragging scorched meat on a string from trap to trap over a distance of perhaps several miles. Wherever tracks would "take" in soft ground we read next morning the tale of an odd Devil following the aroma where their prints were superimposed on our own, and their apparent wariness in having circled the trap without entering. In all, over three and a half months (November, 1945, January, February, March, 1946) we caught nineteen Devils; some fully grown, others half grown specimens of the previous winter's breeding season.

One bristling whiskered mother had the maximum number of four joeys bulging out of her pouch. One morning I was astounded to find a "catch" wearing a glistening yellow "metal" collar and this fact was all the more mystifying considering the remoteness of our surroundings until it was realised that two weeks previously a special composite foot snare of

At fifteen weeks, when turned out from the pouch with eyes just opened, the faintly-haired "little Devils" cling tenaciously to the teats, the number of which impose a quadruplet limit on survival at each birth. The mammae and roomy part of the pouch are in front of the opening, instead of posterior to it as in the kangaroo family.

Photo.—David Fleay.

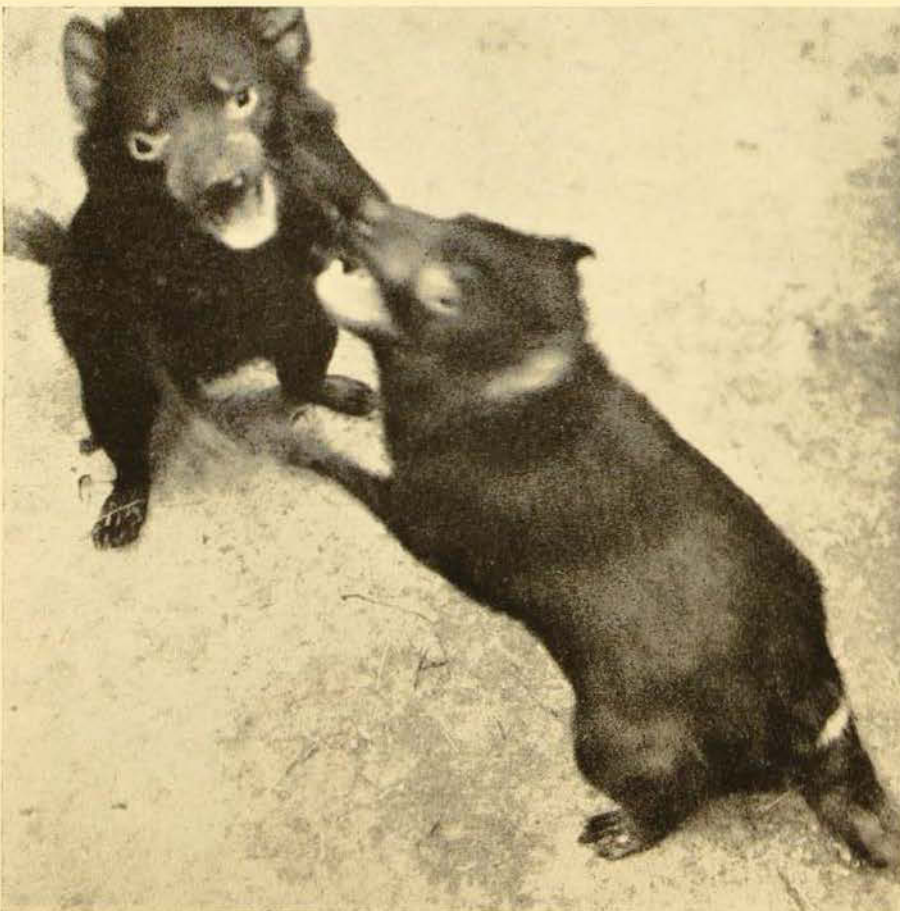




brass wire and hemp set for a Marsupial Wolf had been found sprung and bitten off. Another huge fellow, a grand old man of the Erebus, glared balefully from behind a shut door one morning and when I turned him loose he rushed for the river bank, dived into the icy current and swam strongly to the opposite side disappearing among the ferns. On an early morning round of the traps it was grand fun when approaching to see the trap doors down; but not so good to find that the chubby native swamp rat (*Rattus lutreolus*) had dined heartily on the bait and then quietly slipped out through the mesh.

Most of the Devils in this south-west region were almost completely black, with the merest traces of the usual large white patches on rump, chest, and shoulders seen in Devils farther north and east. Like many other animals, Devils vary a good deal in disposition. Some are extremely pugnacious, and should two such individuals meet, their rasping snarls of hate, rising to a savage crescendo, are louder and more startling than the cries of any other Australian marsupial. Vicious snarls ascend to fierce screams, interrupted

by the clashing of their abnormally large teeth and the sounds of battle carry far in the stillness of night. It is not uncommon for large males to interlock their jaws and the crunching and breaking of their tusk-like canines has quite a blood-curdling effect. But these are the bad tempered Devils. There are others that whine and snarl merely as a form of polite conversation, while their antics proclaim their playful good humour. Nevertheless, it can be imagined that entry into the cramped area of cage traps with newly caught and somewhat desperate Devils is a supreme test of nerves. Slow deliberate movements are the order of the day and any swiftness of action in the attempt to remove a captive spells disaster. The only injury on our Tasmanian expedition, apart from fingers bitten when recapturing two young Devils that ran about the deck of the steamer all night on the way home, was a painful elbow bite from the last Devil caught. It made a dash for liberty during cage cleaning operations on the shores of the Great Lake, on Tasmania's "roof". My flying tackle was effective but fraught with painful results when the "lady" retaliated with a scissors to the elbow.



A unique picture of males in fierce combat. Really bad-tempered Devils at such times, their widely gaping jaws often interlock, when the scrunching of the powerful teeth, snarling and fierce screams have a quite blood-curdling effect.

Photo.—David Fleay.



In the Devil family both father and mother have a well developed nest-building instinct and in the cave, hollow log or cavity among upturned tree-roots, where they sleep away the daylight hours, comfortable beds are made of bark, button grass or leaves. In captivity they are quite ready to adopt bags or straw as substitutes. Ensnared in such a comfortable home, away from marauding males of her kind, which are not above cannibalism where tender youngsters are concerned, the mother Devil produces her babies each year at the end of May or very early in June. Arrival of the young is strictly seasonal. There are four teats deep in the pouch and therefore accommodation is limited to four joeys, cubs or Devils whichever you are pleased to call them. The pouch, by the way, is insignificant in its off-season state, only developing to form a definite pocket several weeks before young are due. Interesting enough also is the fact that its roomy part is anterior to the opening—not posterior as in the case of the jumping or upright marsupials. Thus mother Devil running on all fours cannot easily snag her pouch on sticks as she runs through the scrub.

Examination of the pouch for notes on the development of babies may be performed periodically by using the stout carrot-shaped tail as a handle, at the same time keeping well clear of the fierce array of teeth at the opposite end. The change in the pouch, indicating its seasonal development, begins in April and it enlarges steadily from then, the internal lining becoming glandular and moist and covered with a reddish pigment.

#### BREEDING AND GROWTH IN CAPTIVITY.

To record the progress of the young and idiosyncracies of their mother I cannot do better than describe a successful "event" among my Devils in 1934. It is of note that as far as records go captives had only bred once previously to the occasion described here. Some thirty years ago Mrs. Mary Roberts of the Beaumaris Zoo, Hobart, first brought about the breeding of Devils. The large robust male of the pair I had selected to breed was a fine sabre toothed chap who adopted a remarkably

proprietary air towards his mate. During April when I visited their enclosure at night he would rush forth with bared teeth giving sharp angry sniffs and also wheezing coughs that sounded harshly like "Horace" as he jumped upward and attempted to bite. Usually he moved about the run with that clumsy stiff-bodied cantering gait and elevated tail so typical of his kind. In the first days of June four tiny, pink, naked and blind babies each a half inch in length had betaken themselves to their mother's pouch. Shortly after this the father was removed to bachelor quarters, for the mother now showed resentment at his presence by whining growls which rose abruptly in pitch and volume whenever the male attempted to enter the rock shelter. Early in August at the age of seven weeks the thick-set babies in the pouch had grown to a length of two and three quarter inches. They were still pink and hairless but now it could be seen that their tiny limbs moved actively as they clung tenaciously to the teats within the pouch. They also made slight squeaking noises and with increasing bulk the hind quarters of one quadruplet projected from the pouch as the mother moved about. Meanwhile she had become somewhat fastidious for a Devil, disdaining raw meat but delighting in rats, birds, eggs, frogs and rabbit heads. Towards the middle of August a great change came over the appearance of the youngsters as the ear tips and then other regions of the skin began to show dark pigment. The pouch too, developing with the family, was far more relaxed and roomy. At eleven weeks the dark pigment of the young had become sufficiently pronounced to throw into strong contrast the future white chest and rump markings. The quiet nervous mother accepted the frequent handling with no sign of resentment. Progress of the little Devils was now quite phenomenal and on October 1st at fifteen weeks of age they first released their till then continuous grip on the teats. They were well furred and their eyes had opened. From these observations it is obvious that the mother must carry her cumbersome family with her for at least fifteen weeks after their birth. But from this time on the youngsters



may be left at home in the nest, allowing the mother the freedom necessary for successful "scrounging". When lifted away from the parent the youngsters uttered anxious yapping cries and on being released again clung quickly to the fur of her sides with teeth and fingers—the fore-paws having unusual grasping powers so that the young Devils are expert climbers. On being disturbed from sleep when sheltered by the mother's body, the little fellows lost no time in gripping her extended teats, from which it was almost impossible to dislodge them until firm pressure with a finger-tip over the nostrils caused their mouths to open. At the age of eighteen weeks the "play age" was apparent and though of a totally different colour the young Devils now resembled Native Cats or *Dasyures* because of their sharp-featured faces which lacked the bluntness of the older Devils. At twenty weeks they were seven and threequarter inches in body length with small tails adding a further three inches. They still clung tenaciously to the mother's teats when drinking.

In 1946 at the Badger Creek Sanctuary, four baby Devils, approximately eighteen weeks old were accidentally lost by their mother in a rat warren. There they remained for eight days during which time they had neither food nor drink and were given up as dead. It says something for the toughness of the species that when rescued the emaciated little fellows immediately set about making up the leeway by suckling from their mother for days on end, and all survived the ordeal.

For the general taming of the young Devils, it was considered advisable to separate them from the mother at night. Each evening then from the age of eighteen weeks onwards they were given the run of a lighted room. After two or three appearances the sharp-nosed little fellows gained confidence, scampering actively among couches and chairs and even attempting to climb curtains. When two of them happened to meet they usually halted a few paces apart and then made mock attacks, rushing forward with open

mouths, ridiculous snarls and much simulated ferocity. They were real young Devils!

It was five months before they ceased to rely on their mother's milk for nourishment and unfortunately we lost two of them before they had abandoned the maternal apron strings. One squeezed through the chain netting of the enclosure and was never heard of again while the other sickened and died. The mother and remaining two youngsters showed the thorough scavenging traits of their kind by immediately devouring the whole carcase, except the head, of their deceased relative even though food was plentiful. However the remaining two, a male and a female, attained their maturity and grew into fine specimens. Like most other carnivorous marsupials, the Devil's life is a comparatively short one, and as far as I am able to ascertain such an animal at the age of seven to eight years has lived its allotted span.

#### PLEA FOR CONSERVATION.

And finally a plea for conservation of this and other carnivorous marsupials—all of which being comparatively short lived, with a brief reproductive period, tend under modern conditions to be rapidly exterminated. There is only one hope of giving the *Thylacine* a fighting chance of survival, and eventually of keeping the Devil in existence, and that is to prevent snaring in any form in the whole south-western area of Tasmania, from the West Coast Road down to Port Davey and South-West Cape. At least such a ban could be given a ten years' trial. Tasmania's wild country can be an invaluable storehouse of indigenous fauna, safe from such destructive agencies as closer settlement and the depredations of the introduced fox of mainland Australia. Particularly is it the home of smaller carnivorous species, either long gone or else disappearing rapidly from the land across Bass Strait, largely because we have no such naturally dense, broken and unsettled mountainous country to provide natural sanctuary. *It is a matter not for Tasmania alone, but for the whole of Australia, that this faunal region be preserved now without delay.*



## The Lepakshi Murals

After more than four centuries of neglect and obscurity a small village, 9 miles east of Hindupur on the borders of Madras State, has sprung into prominence within the past two years as an important link in the chain of India's artistic heritage. The village is Lepakshi, where there is a temple dedicated to Virabhadraswami. Visiting scholars and experts on Indian art and architecture have recognised this temple as a repository of some of the best specimens of Indian mural art of the mediaeval period.

The Lepakshi temple, as it is popularly known, is a notable example of the Vijayanagara style of architecture. The empire of Vijayanagara, founded in 1336, became the greatest Hindu state of Southern India in the 14th to 16th centuries. An inscription on the inside of the outer wall of the main entrance records that the temple was constructed in A.D. 1538 by Virupanna. According to legend Virupanna, who was the king's treasurer in the time of Krishna Deva Raya of

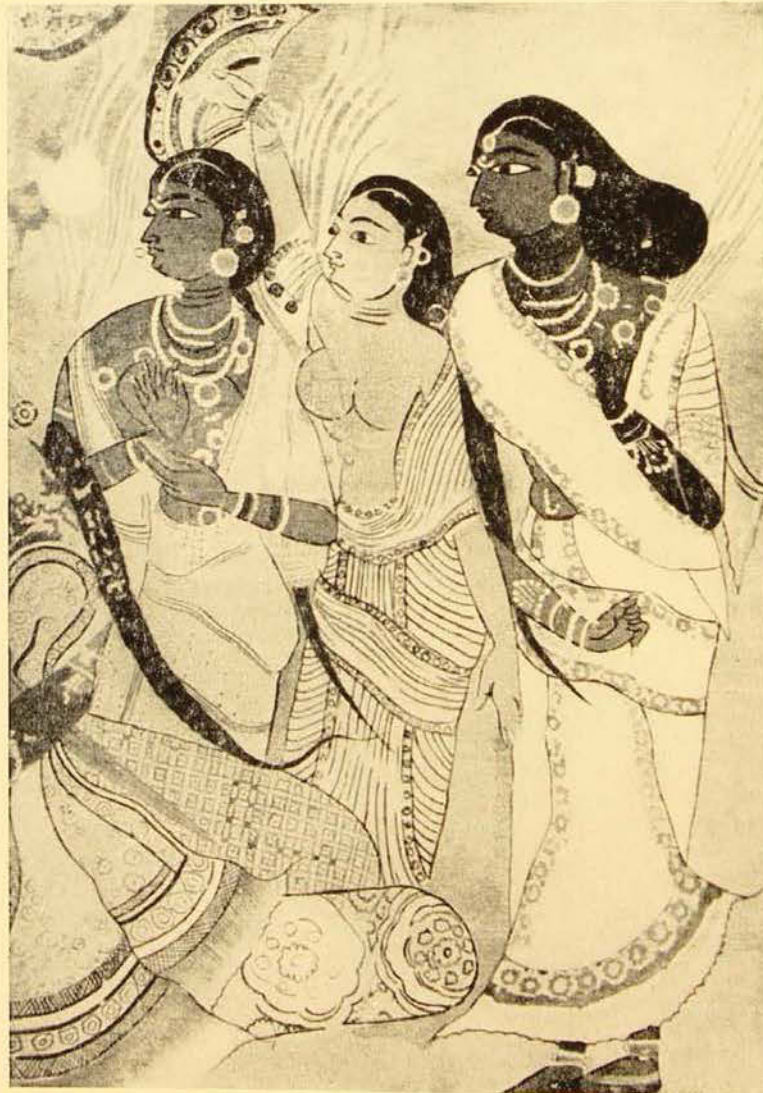


Photographs of faithful replicas painted from a Lepakshi Mural. *Left:* Shri Vishnu, the Protector. *Right:* A drummer in action at the wedding of Siva and Parvati.





*Above:* The unfinished "Kalyana Mandapa" of the Virabhadraswami temple in Lepakshi, showing the exquisitely sculptured pillars.



*Left:* Photograph of a faithful replica painted from a Lepakshi Mural, showing Royal Ladies of the Rayas of Vijayanagara going for worship accompanied by attendants. Their hair style, sari designs and jewellery are noteworthy.



Vijayanagara, incurred the king's displeasure by using the royal funds unauthorisedly to build the temple. He was therefore punished by the king and the building of the temple was brought to an abrupt end before completion.

The unfinished "Kalyana Mandapa" or "hall of devotion" of the temple appears to have been conceived in a grand style and has many noteworthy sculptures adorning its pillars. Close to it is the completed "Natya Mandapa", the hall of the religious dance, which is the finest part of the temple. It is supported on sixty-six exquisitely sculptured pillars, of which the columns of the central group bear lifelike representations of heavenly musicians and dancers carved out of stone with an exuberance of ornamentation typical of the art of the Vijayanagara period.

Some two hundred yards east of the temple is a colossal monolithic bull, 15 feet high and 27 feet in length, carved with great care and skill.

The most remarkable feature of the Lepakshi temple is the ceiling of the "Natya Mandapa" which is covered with numerous life-size frescoes painted on it, representing scenes from the national epic poems and histories, the Mahabharata, Ramayana and the Puranas. These murals exhibit a wonderful mastery over the arts of drawing and colour. The *Kiratarjuniya* scene depicting a fight between Siva disguised as a hunter and Arjuna over a boar, Sri Rama's coronation and Sri Krishna as *Vatapatrasayi* (resting on the leaf of the banyan tree) are among the finest examples of Indian mural art. The story of Arjuna's penance is shown in various episodes, and pictures of Vishnu, Vayu, Agni and other important Gods of the Hindu Pantheon form the theme of another row of paintings representing the marriage of Siva and Parvati. Perhaps the finest painting is the *Manabhanga* or Siva appeasing his spouse Parvati in anger.

Some of the paintings, which show women worshippers on their way to temples, are noteworthy for the sari designs they depict, which closely resemble the modern "printed saris".

It is evident that the artists of the Vijayanagara period who executed these paintings had an excellent sense of line and form and of good composition. Their colour schemes are extremely pleasing and the facile contours and interplay of brushstrokes in the frescoes bear testimony to the mastery which these artists possessed over the art of mural painting.

While there is an unmistakable touch of the classical tradition and of Ajanta influence in these murals, they cannot be classified as belonging to the Ajanta school of mural painting. These paintings may be said to represent the Vijayanagara phase of the mediaeval mural art in India.

Due to percolation of water through the cracked and leaky roof and other natural causes inherent to the situation and also as a result of human vandalism combined with the accumulation of soot, cobwebs, etc., these beautiful frescoes have suffered considerably.

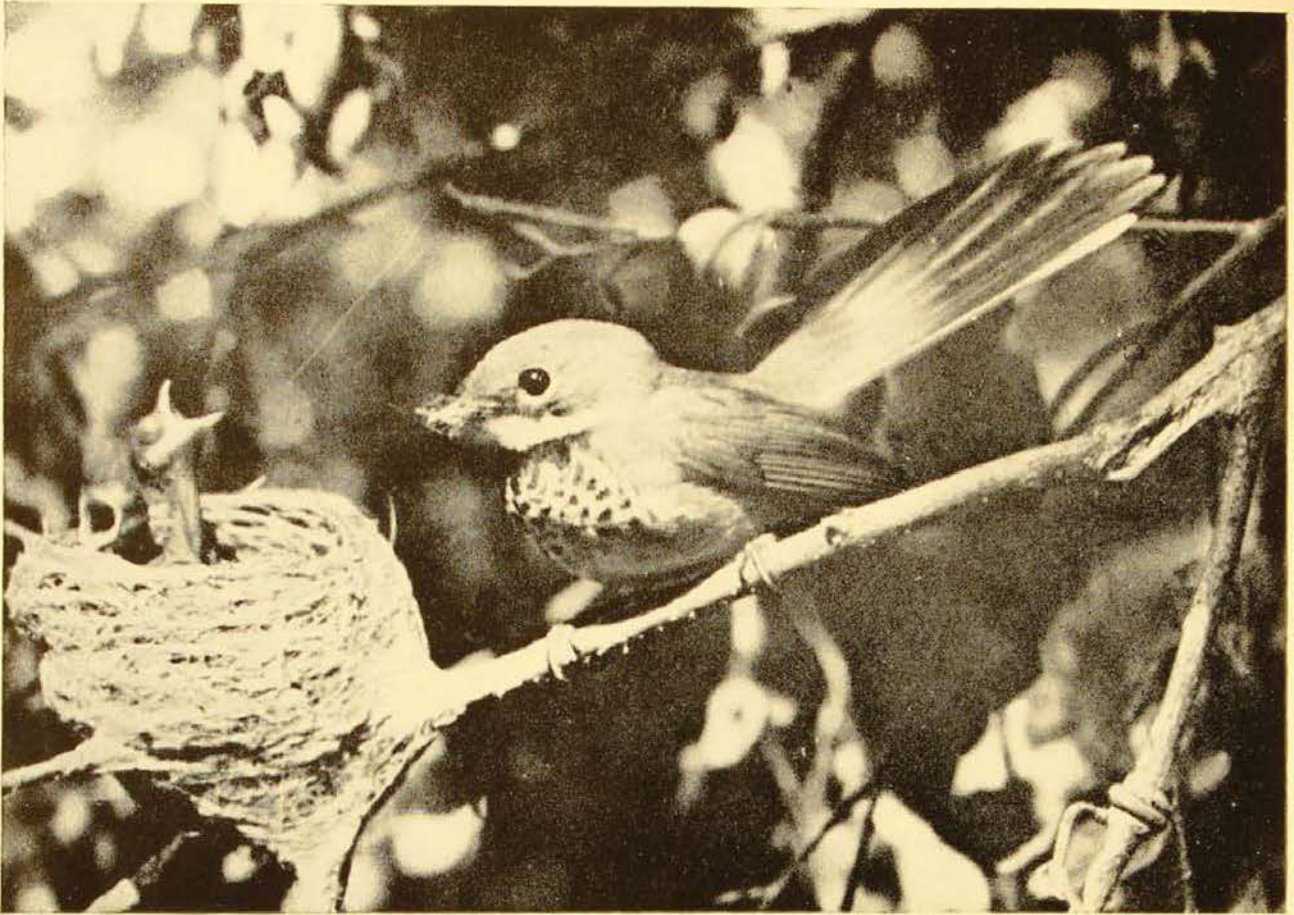
Last year the Government of Madras engaged the services of well known artists to reproduce the more important frescoes of the Lepakshi Temple. A set of skilfully executed replicas were publicly exhibited at the Madras Government Museum, with a view to drawing public attention to these ancient and beautiful murals.

The Archaeological Department, Government of India, has taken up a programme of chemical preservation of the paintings from further decay and deterioration and also the execution of such structural repairs as may be needed for their future maintenance.

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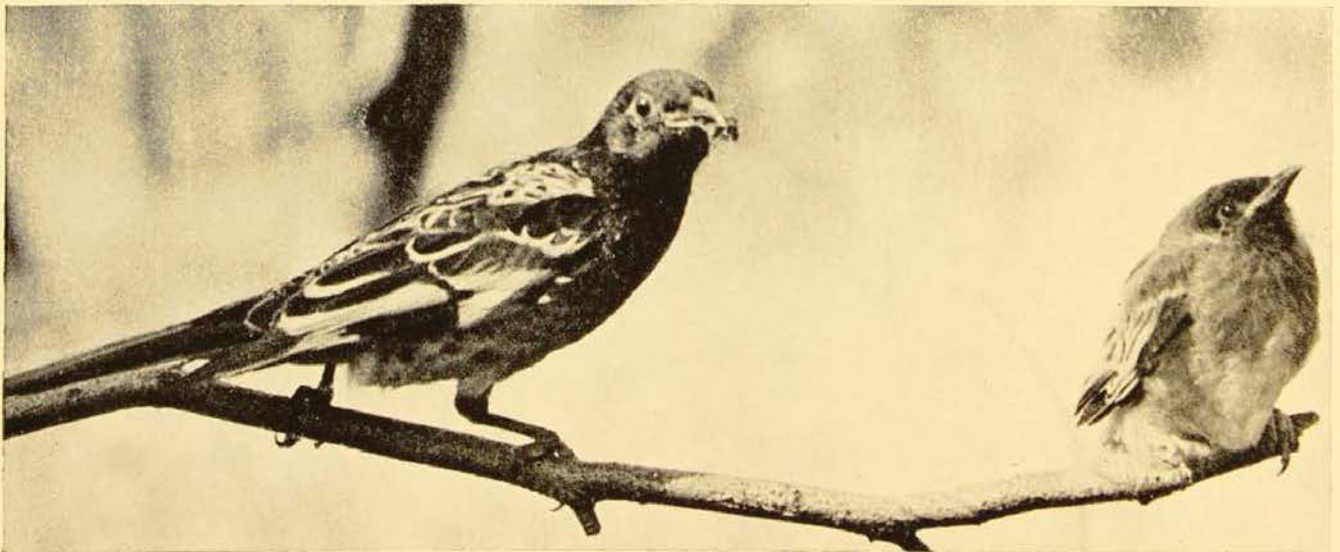
This article and the photographs are published by courtesy of the Information Officer for India, Canberra.





*Above:* Rufous Fantail with young.

*Below:* The Regent Honeyeater and chick. This is one of the birds that does not undertake a regular migration, but is a nomad, following the blossoming trees.





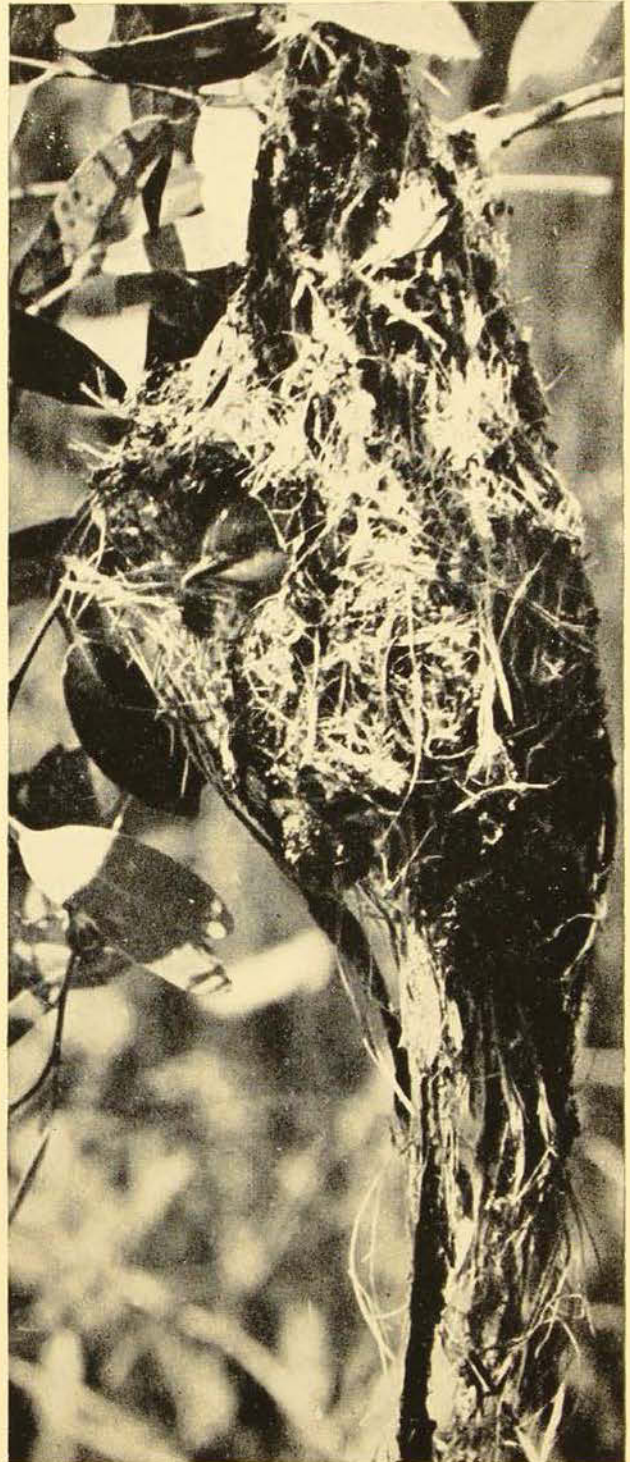
## Some Forest Migrants

By J. A. KEAST, B.Sc.

WHILST the majority of our forest birds remain in an area throughout the year a number of them are migrants. Some, such as the nectar-feeding lorikeets and honeyeaters, are merely nomads, undertaking circuitous and ill-defined movements from district to district as the food-supply varies. One or two species like the little Scarlet and Flame Robins move from mountains to lowlands at the beginning of winter. A number, however, have definite north-south movements, the extent of which vary from species to species and, within each species, from place to place.

A few Sacred Kingfishers spend the winter in the more southern parts of New South Wales but the majority move into Queensland, where they hunt insects and lizards in the forests or dive on crabs along mangrove-fringed foreshores. They return south in August and September and individual pairs are soon distributed throughout the coastal bushlands. Their loud, strident, breeding call-notes resound through many of Sydney's suburbs during spring and summer, including such closely-settled districts as Mosman and Wollstonecraft. The nest is at the end of a tunnel in a termites' mound or in a tree hollow.

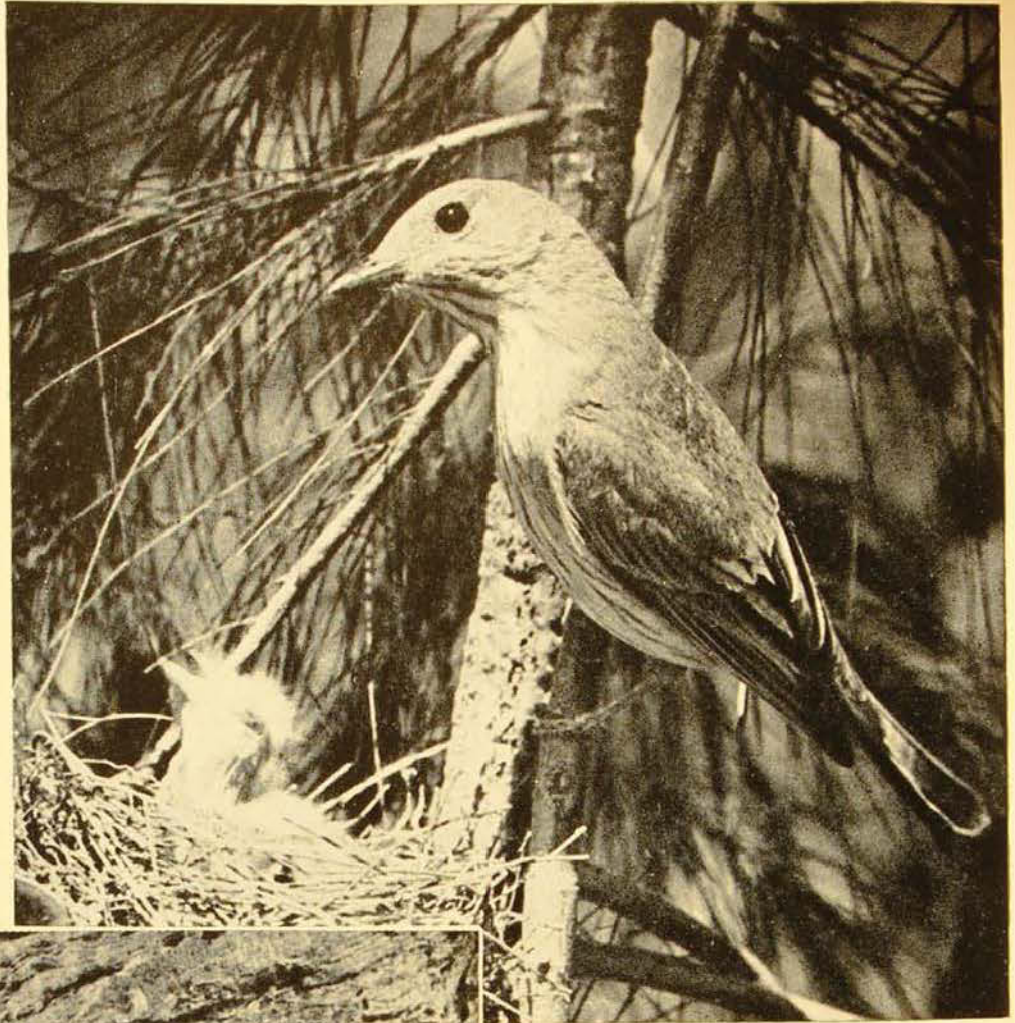
The White-throated Warbler or Wild Canary is another bush migrant and is well-known for its delightful cadence of warbling notes. About Sydney, they arrive in the first fortnight of September from wintering grounds to the north of the State and in Queensland. The species is very vociferous during the spring but becomes progressively quieter as the breeding season advances, finally becoming so silent that it is difficult to judge when they leave for the north again. Migration probably commences in late February and continues throughout March.



Wild Canary incubating eggs in her pendant nest.



*Right:* Female Rufous Whistler feeding young.



*Left:* Sacred Kingfisher feeding young in a hollow limb.



The movements of the Rufous Whistler resemble those of the Wild Canary. Here, too, the birds are very noisy on arrival, so much so that it is easy to record the first for the season, but they quieten in summer. The male bird is very attractive: rufous on the breast, with a black crescent of feathers separating it from the white throat. The female, on the other hand, is brownish in colour, with conspicuous striations on the pale breast and throat. Both sexes frequently utter the loud "Ee-chong" call notes.

Rufous Fantails restrict themselves to the denser brush-covered valley floors

whilst breeding but temporarily frequent open timber and gardens en route to and from their northern wintering grounds. Main breeding places about Sydney are in National Park, to the south the Illawarra scrubs and the Gosford-Ourimbah area to the north. They do not arrive in Sydney until late September but may continue breeding until the end of February. As with the other species mentioned the exact wintering grounds of the birds of any area are not known, but they are to be seen in various parts of coastal Queensland during the winter.

## Australian Insects, XLV

### COLEOPTERA, 22.—TELEPHORIDAE AND LYCIDAE

By KEITH C. McKEOWN

THE preceding article in this series discussed the Fire-flies—one of the families, the Lampyridae, formerly gathered together under the name of Telephoridae or Malacodermidae. The latter name, although widely used, had no actual standing, since it was not based on the name of any genus included in it. The Telephoridae and Lycidae were formerly classed as subfamilies, but have been raised to family status. It is proposed to deal with these two groups here.

The Telephoridae are popularly known as "Soldier Beetles", perhaps because their bright colours are reminiscent of the military uniforms of past times, or from the mass manoeuvres sometimes carried out by them. They are considered to be the most primitive of these families. Their integument is soft, the prothorax undivided, and the wing-covers (elytra) devoid of complex sculpturing and somewhat abbreviated in some genera. The insects are generally slender and of small to medium size.

Little is known concerning their life-histories. From the scanty information available, they appear to be carnivorous.

The Australian species most commonly encountered is undoubtedly *Telephorus pulchellus* Macleay, a slender beetle about half an inch in length. The wing-covers, which do not cover the last segments of the abdomen, are a rich metallic bronze-green, but some specimens may be of a distinctly olive-green hue. The exposed portion of the abdomen is bright yellow; the fore-part of the glossy thorax black and the remainder bright yellow, but the extent of the black area is very variable, and may even be wanting. The male is much smaller than the female, which is about half an inch in length.

Mr. E. H. Zeck wrote of the remarkable swarming habits of this Soldier Beetle in the *Australian Zoologist*. He tells how:—

"Early in February, 1919, thousands of Soldier Beetles, *Telephorus pulchellus* Macleay, were observed swarming in



numerous groups by the roadside above the falls at Katoomba, New South Wales. One side of the road was formed by a low cutting about 2 feet high, while the other, which sloped quickly away to the gully which runs into the falls had been banked up with stones and earth.

"Numerous holes and crevices in the sloping bank of the low cutting were seen to be entirely filled with the beetles, while on the opposite side of the road they were swarming over stones and climbing up into the tussocks of grass. Many others were in flight, while large numbers, which had evidently been wandering across the road, lay crushed upon the ground, having been run over by passing vehicles or walked upon by pedestrians.

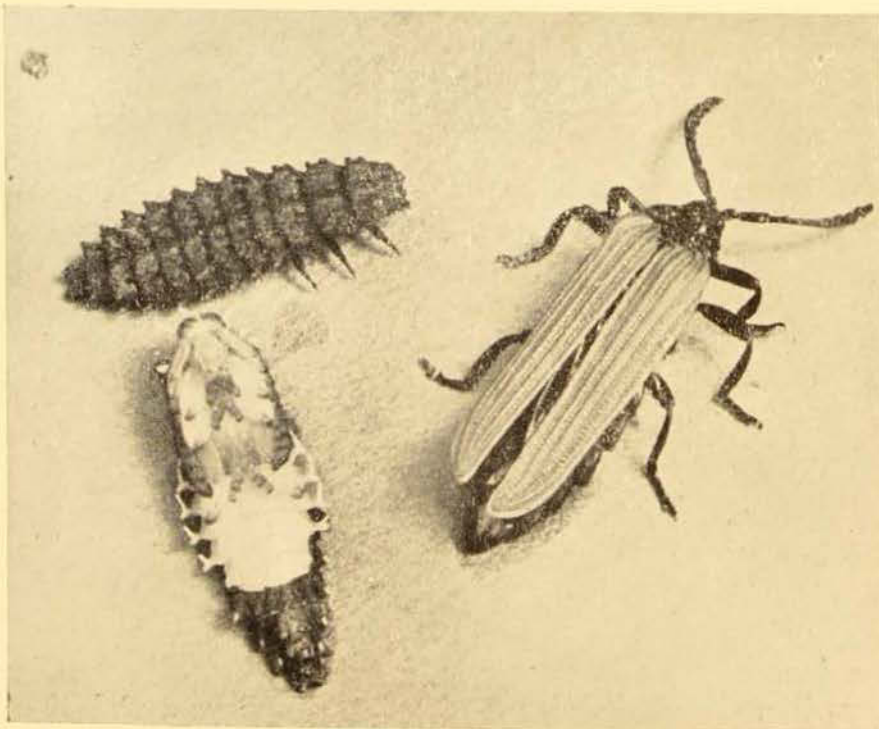
". . . Besides the larger masses, numbers of smaller groups were scattered about, some consisting of many, and others of only a few specimens. From a little distance these groups had the appearance of dark green moss upon the stones."

Mr. Zeck's account is illustrated with a striking photograph of the massed insects.

W. W. Froggatt wrote that he had "seen the Melaleuca scrub on the Blue Mountains black with them." A. M. Lea recorded that they occasionally eat the caterpillars of the Codling Moth.

From November, 1951 to January, 1952, numerous inquiries were received from Artarmon, Lane Cove, Beecroft, and other suburbs to the north of Sydney concerning these beetles, also from the lower Blue Mountains and Mittagong; they were reported to be swarming in vast numbers in gardens covering lawns and flowering shrubs with a moving mass of considerable extent. In one instance they were reported to be covering a lawn to a depth of "a couple of inches"; here, despite spraying and the sweeping-up of the resulting corpses, the insects continued to appear in apparently undecreased numbers. No damage was reported anywhere as the result of the invasion, and no satisfactory reason could be discovered to explain the presence of the swarms, the largest and most widespread to come to my notice.

Another common Soldier Beetle is *T. carnipes* Lea, which is of a general pale yellow tint with the base of the elytra narrowly black, and a rounded black spot situated towards the apex of each elytron; the thorax is yellow with a broad transverse black band across its centre. This New South Wales species is very similar in general appearance to *T. atricornis* Lea, in



The life-history of *Metriorrhynchus rhipidius*.

Photo.—P. Walker.

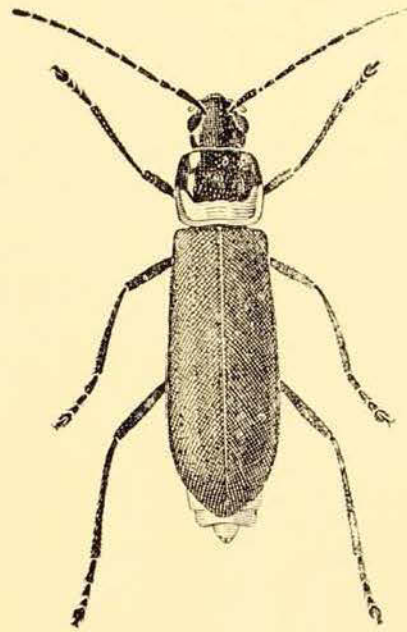


which the rounded black spots are wanting. *T. apterus* Olliff is a remarkable insect, from Lord Howe Island, in which the blue elytra are so extremely short that only a very small portion of the abdomen is covered by them. Superficially, the insect is rather like a brightly coloured Rove Beetle (Staphylinidae).

Members of the genus *Heteromastix* are much smaller insects than in *Telephorus*, and do not exceed a quarter of an inch in length. Although conforming generally to the appearance of the other genera of Soldier Beetles, they are broader and more compact, with the wing-covers covering the extremity of the abdomen. In *Selenurus* the form is similar to that of *Telephorus*, but is more slender. Common species are *S. sydneyensis* Blkb., in which the coloration is similar to that of *T. pulchellus*, but the elytra are shorter and leave more of the abdomen exposed: this is a New South Wales species. *S. v-flavus* Lea, from eastern Australia, is black with a v-shaped margin of yellow around the elytra.

The Lycidae have the thorax divided, and the elytra, slightly broadened at the apices, bear very fine and intricate sculpturing. In *Metriorrhynchus* some species have an elongate rostrum (or "proboscis") somewhat reminiscent of that of the Weevils (Curculionidae). The integument and elytra are soft, as in the other allied groups. Again, little is known concerning the life-history of these insects, but they are definitely carnivorous, the larvae preying upon other insect larvae and pupae. The adult beetles are commonly attracted to the blossoms of flowering trees and shrubs.

Most of the Australian Lycidae are included in the genus *Metriorrhynchus*, of which eighty species have been described. They are mostly of a rich terra-cotta colour with the head and thorax black—but some species are dark brown, which may be varied with yellow. The Lycids, which are extremely distasteful to birds and predaceous insects, are closely mimicked, both in form and colour by numerous other insects—beetles of the families Oedemeridae, Cantharidae, Cerambycidae, Buprestidae,



The Soldier Beetle, *Telephorus pulchellus*.

After E. H. Zeck.

and Curculionidae, as well as by certain flies, wasps and moths. The colour-scheme must provide a very successful warning to enemies, since it is so extensive. The whole of this mimicry is extremely interesting, but its details and full implications have not been fully worked out; it would, however, provide a fine field for specialised study. I have repeatedly found many fine specimens of the Longicorn genus, *Chaodalis*, in collections of Lycidae.

The commonest and most widely distributed species is *Metriorrhynchus rhipidius* Macleay, which is found in all the States. It is very variable in size, but may range up to almost an inch in length. The finely and intricately sculptured elytra are a rich terra-cotta or orange-brown colour, with the head and thorax black and glossy. The curiously shaped larva is dark-brown to black in colour, but may frequently be found under stones, logs, and similar situations.

Other, and smaller, species are *M. marginipennis* Lea, dark-brown margined with dull yellow, and *M. rufipennis* Fabr. var. *haemorrhoidalis* Waterh., which is also dark-brown with the apices of the elytra a rich reddish-orange.

The allied genera, *Trichalus* and *Calachromus* are also well represented in Australia.



# A *Werpoo*, or Bone Dagger, from South Australia

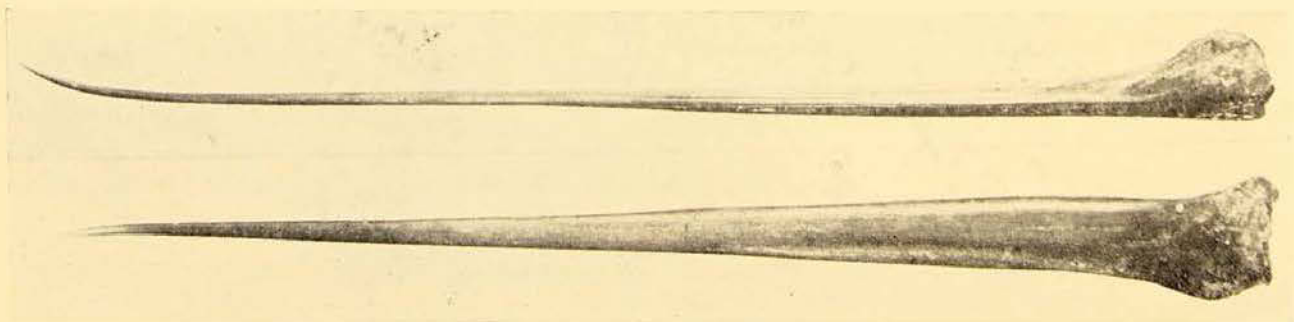
By FREDERICK D. McCARTHY

IN the Harry Stockdale collection presented to the Australian Museum by Sir William Dixon, there is a remarkable bone dagger called the *werpoo*. It is made out of the shin-bone or tibia of an emu, portion of which has been slit off so that the dagger is concavo-convex in section. It is 14 3-16th inches long, the butt is 1 3/8 inches wide, and it tapers to a very fine point at the other end. Both edges are rounded. The last inch of the smooth and polished pointed end is bent upwards transversely, from the concave to the convex surface. Six inches of the butt end is painted red but most of the pigment has been worn off the higher parts. It is a carefully fashioned implement on which much of the smoothness appears to be due to handling, and it was apparently in the possession of the aborigines for a long period.

<sup>1</sup>Wyatt, W., 1879.—Some Account of the Manners and Superstitions of the Adelaide and Encounter Bay Aboriginal Tribes in *The Native Tribes of South Australia*, by J. D. Woods and others.

Wyatt (1879)<sup>1</sup>, in his brief account of the Adelaide and Encounter Bay tribes, stated that:—

“Certain other beings, inhabitants of the earth, are dreaded by the natives, for the mischief they do. These they call *nokoona toorlanan*, which seems to signify ‘*nokoona*, the destroyers,’ from ‘*toorla*, to fight or kill.’ At Encounter Bay their name is ‘*Dlarbe*,’ and the natives silently allude to them by holding up the fore and little fingers. They are accused of killing men, women and children, by coming stealthily upon them in the dark. One is described as a very large black man, eight feet or more in height; and some of them were killed a long time ago by men of a distant country. One native most accurately explained to me the mode in which they destroy their victims: going through the process by imitative motions. He first spread his blanket upon the ground, and bade me suppose that a man was under it asleep. He then retired a few paces, laid himself down at full-length, crept along upon his elbows with the least possible noise, and beckoned to me to reach him a little stick he had prepared to represent the weapon. When he had arrived close to the blanket, he very carefully lifted up the corner of it, and said ‘Here are the head and neck.’ The stick was slowly thrust into the earth



Photographs, from two different angles, of the *Werpoo*, or Bone Dagger described in the article. It was presented to the Australian Museum by Sir William Dixon.



(as if into the neck, above the collar-bone) in a slanting direction; and, when it had been made to penetrate about six or eight inches, was in the same manner withdrawn; the finger and thumb of the left hand being ready to close the imaginary wound. This was immediately done, and, after the orifice had been kept closed by the pressure for a short time, a little earth was taken up and sprinkled upon the part, and the native said, 'there is no blood, no wound to be seen, and the man is dead.' This pantomimic representation was performed with great solemnity, and the explanations were uttered in a whisper. On the night of the 8th of March, 1838, a colonist named Pegler was killed by two blacks, the wound being inflicted in the manner above described, and there is no doubt that natives are sometimes deprived of life in the same way, and the murderers escape by acting upon the superstitious fears of the relatives."

Bull (1884)<sup>2</sup> described the murder of a shepherd with the *werpoo* as follows:—

"I was told, soon after I arrived, that the old men or doctors of the tribes had devised this mode of taking the lives of the white men, so as on the withdrawal of the instrument, and pressing down the small half-circular flap, little blood could escape, and the spirit would not pass out, as they believed, to trouble them. On the alarming news being brought to me that Duffield was lying on the plain (about 4 miles north of Adelaide) dying or dead, I lost no time in going out with a conveyance, and finding the poor fellow prostrate, and suffering the greatest agony. I brought him into town that he might have the attention his case required. With much difficulty he told me that three black men were walking with him quietly, one on each side of him and one behind, conversing in friendly terms. One of them asked him suddenly for a sheep. On his saying 'No,' he received a severe blow from the one behind him with a heavy waddy, and fell down insensible, but shortly became conscious, and felt he had been pierced upwards from just below his ribs. He said he saw one of them withdraw the instrument he used. He spoke with such difficulty that I thought his vitals had been pierced; yet on examining him at the spot he pointed out, I could perceive very small marks of blood, the wound was closed, and was to all appearance such as would be seen after a heavy pressure of a man's thumbnail; the small flap must have been pressed down as stated in Dr. Wyatt's account of the death wound inflicted on Pegler. Duffield was without loss of time placed under medical treatment. On examination it was found that the fine and sharp instrument used had been passed a short

distance under the skin and then pressed upwards and had passed through the lungs. Duffield as he informed me, was on his back—that is, on his head and shoulders; that a black named 'Rodney' was placed between his legs, which were held up by a black behind Rodney's back, and so the sharp bone was conveniently used. The instrument used was a finely sharpened and thin leg-bone of an emu. Every attention was exercised to relieve the sufferer, but nothing would save him. He lingered about forty-eight hours. Rodney, his murderer, had not long before killed his own lubra.

"Another mode of using the *Werpoo* was practised upon Pegler who was murdered by two Adelaide aboriginals (brothers) named William and George. He was pierced through the heart by a sharpened kangaroo bone, passed in a slanting direction down from the neck, whilst under the influence of drink.

"Rodney was never punished for his crimes escaping from his first captors and never again heard of. George and William . . . were both arrested after considerable trouble and placed in irons, they, however, managed to escape (iron and all) during the night—their irons being found next day in the bed of the river Torrens. Some months after one of them, George, was recaptured, tried, and hung, having in the meantime committed further murders."

Wyatt's account establishes the fact that the *werpoo* is a traditional native weapon, and was not, as Bull was told, devised for the purpose of killing white men. Both accounts make it clear that the *werpoo* was used by the "doctors" and not by the men generally.

Stockdale, in a note about this specimen, stated that—

"*Werpoo* or murder bone of the tribes inhabiting the country around the city of Adelaide is beyond doubt the most remarkable and interesting specimen of aboriginal craft and ingenuity ever yet discovered. It is probably unique. This remarkable implement has been in the possession of the Stockdales for over sixty years. My uncle, the late Edward Stockdale of Lake Hawden and Richmond Park, South Australia, a very early squatter, and Mr. Alex. Tolmer, one-time Chief Commissioner of Police, Adelaide, on several occasions spoke at length to me about its use and both agreed that its use was upwards exactly as described by Bull. There can be no doubt that these tribes practised two different modes of killing with this singular weapon. One downwards from the shoulders or breast and the other upwards from the floating ribs passing immediately under and parallel to the skin until opposite to the heart when the instrument was turned or twisted

<sup>2</sup> Bull, J. W., 1884.—*Early Experiences of Life in South Australia*.



point inwards, and considerable pressure being used enabled the sharp point to pierce the violently beating heart, as their victims were not at the time of the operation quite unconscious. Most likely the puncturing of the heart was what was aimed at by both processes. Duffield, however, died from the bone piercing the lungs. My uncle was assured by

the natives that the bones used were always obtained from the Emu, the blacks considering such bones more suitable, although they were also made from the leg-bone of the kangaroo. And that one blackfellow held down the two arms and another black held up the two legs behind and on each side of the operator who kneeled between them.

## The Sir William Dixson Collection

Since 1912, Sir William Dixson has presented to the Australian Museum at various times valuable collections of anthropological specimens. These now total almost 1,500 specimens from Australia, New Zealand, Pacific Islands, Ceylon and India. They include a very choice collection of 900 specimens from all over Australia and from New Guinea and the Bismarck Archipelago collected by Harry Stockdale, and another series of almost 200 specimens collected by A. Bringa Robertson. These specimens filled many gaps in our Australian collection.

In December, 1951, Sir William Dixson presented just over 400 specimens from Australia, New Zealand and Polynesia. There are 205 Maori pieces in this collection and they include thirteen wood carvings, comprising a pui-pui board, three large human figures, a face-mask, 2 model canoe-prows, and several boxes; twelve kotiate and patu wooden hand-clubs, one staff and ten paddles, all beautifully carved; eight wooden weapons, including tewha tewha, taiaha and clubs. The magnificent series of Maori jade or greenstone objects consists of seven mere, twenty adzes and chisels, forty-one hei-tiki, fifty-five ear-pendants, three peka peka and five hei-mataa spiral pendants, two bird-leg rings or poria, an image of Tangaroa, god

of fishing, and several other pendants. There are in addition from New Zealand a bone flute, two bone combs and four cloak-toggles, and several basalt and bone mere. Many of these specimens are beautiful examples of their type and they form a most invaluable addition to our Maori collection.

Among the other specimens presented are old Tongan clubs one of which is dated 1798; a beautifully carved paddle from the Cook islands; a kava bowl with coconut cup from Fiji; and eighteen adzes, including greenstone implements, from New Guinea and New Caledonia. Of special interest are twenty-two brass breast-plates (about which an article is to be written in a future issue of this Magazine) issued to aboriginal "kings", "chiefs", overseers, and other important individuals in New South Wales. Another most interesting item are the manuscripts, with illustrations, of the first six Bulletins of North Queensland Ethnography, by Dr. W. E. Roth, and published in Brisbane.

Sir William's kindly interest in the Museum has been maintained for forty years, and to him we are indebted for numerous valuable specimens, as a perusal of the above list will reveal.

—F. D. McCarthy.





## An Insect Calendar

### Part III

By A. MUSGRAVE

**I**N this the third and last part of our Insect Calendar, we conclude with the Autumn and Winter seasons, the colder months of the year. Towards the middle of February, in the latitude of Sydney, the weather usually breaks, as it did in mid-August, but this time cooler weather begins to take the place of the humid and oppressive days.

In February, the last month of Summer, the mean maximum temperature for

\* \* \* \* \*

The Australian autumn months, March, April and May, show a considerable diminution in the numbers of the insect host for, with the advent of the westerly winds which begin in March, insect life goes into hiding and only some of the more robust forms are encountered.

The introduced Starling, *Sturnus vulgaris*, now congregates in numbers towards dusk in the Sydney parks or wheels in airy armies before settling in some leafy tree for the night. The noisy Currawongs or Black Magpie, *Strepera graculina*, invade the outer suburbs in flocks with their loud and somewhat mournful cries of "Currawong Currawauk", to which they owe their popular name.

Sydney is 77.7°F. and the mean minimum 65°F. May, the last month of Autumn, shows a drop to a maximum temperature of 65.5°F. and a mean minimum of 52.2°F. July, the coldest month, enjoys the bracing temperatures of 59.8°F. mean maximum, and 45.9°F. mean minimum. August shows a gradual return to warmer conditions with a mean maximum of 62.8°F. and a mean minimum of 47.5°F.

This is the time of the year when the leaves fall from the deciduous trees, or "The Fall", as it is termed in the United States, and autumn tints change the foliage of the Japanese Maple and the Virginia Creeper. When the leaves have fallen from some deciduous tree or bush we may be startled to see the comb made by the bees during the summer when leaves covered the plant. Such a comb was seen by me at Waverton, near Sydney, one autumn day.

The fall of the leaves marks the time when many insects enter their pupal or chrysalis stage, there to pass the Winter months until Spring liberates them from





Comb of Honey bee, *Apis mellifera*, suspended in a bush in a garden at Waverton, near Sydney, and visible only when the autumn leaves had fallen.

Photo.—A. Musgrave.

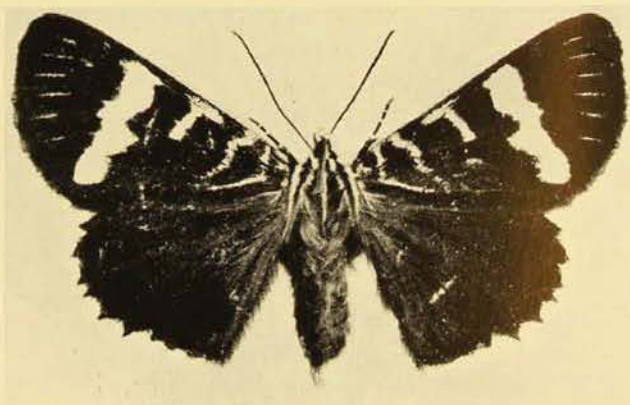
their cocoons and chrysalids. Others pass the colder months in the egg stage, while some larvae of wood-boring moths are said to take some years to reach maturity and are probably little affected by seasonal changes.

The Day-flying moth or Grape-vine Moth *Phalaenoides glycine*, over-winters in the pupal stage in a cell in the ground or among leaves. It is one of the first insects to appear on the wing in the early Spring, and the larvae feed upon the leaves of Grape vines, Virginia Creeper, Fuchsia, *Hibbertia* and *Glycine*, and may be taken in August and September. The eggs are laid on the leaves and the larvae are noted for their destructive habits of defoliating vines. The larva passes through five moults before reaching its final state in which it may measure about two inches. It is greenish-yellow with black lines and reddish spots. The insect is kept in check to a certain extent by certain species of bugs of the family Pentatomidae, which prey upon them.

It was upon an Autumn day (3rd March, 1941) that I was fortunate in witnessing the larvae of the Australian Tussock Moth, *Euproctis edwardsi*, descending from the mistletoe down the trunks of the trees in order to pupate. An account of this moth and its poisonous spicules was later given in the AUSTRALIAN MUSEUM MAGAZINE.<sup>1</sup>

The month of April is interesting historically for Australians since it marks the commencement of our knowledge of Australian insects. It was towards the end of April, 1770, that Banks and Solander, the naturalists on Captain Cook's ship, the *Endeavour*, landed at Botany Bay. The Banksia trees about Sydney and elsewhere in Australia, will always serve to remind us of this great botanist, collector, and President of the Royal Society of London. The well-known Botany Bay Diamond Beetle, *Chrysolophus spectabilis*, secured by the expedition, was almost certainly taken at Botany Bay. It is a "weevil" and thus a member of the family Curculionidae, and its patches of metallic blue-green scales render it conspicuous. It feeds in the adult stage upon wattles and, according to Froggatt, it lays its eggs in the butts of the trees and the grubs form irregular tunnels in the wood. I once secured a photograph of one at Clifton Gardens on the 27th April, 1924, which corresponds approximately to the time of Cook's visit.

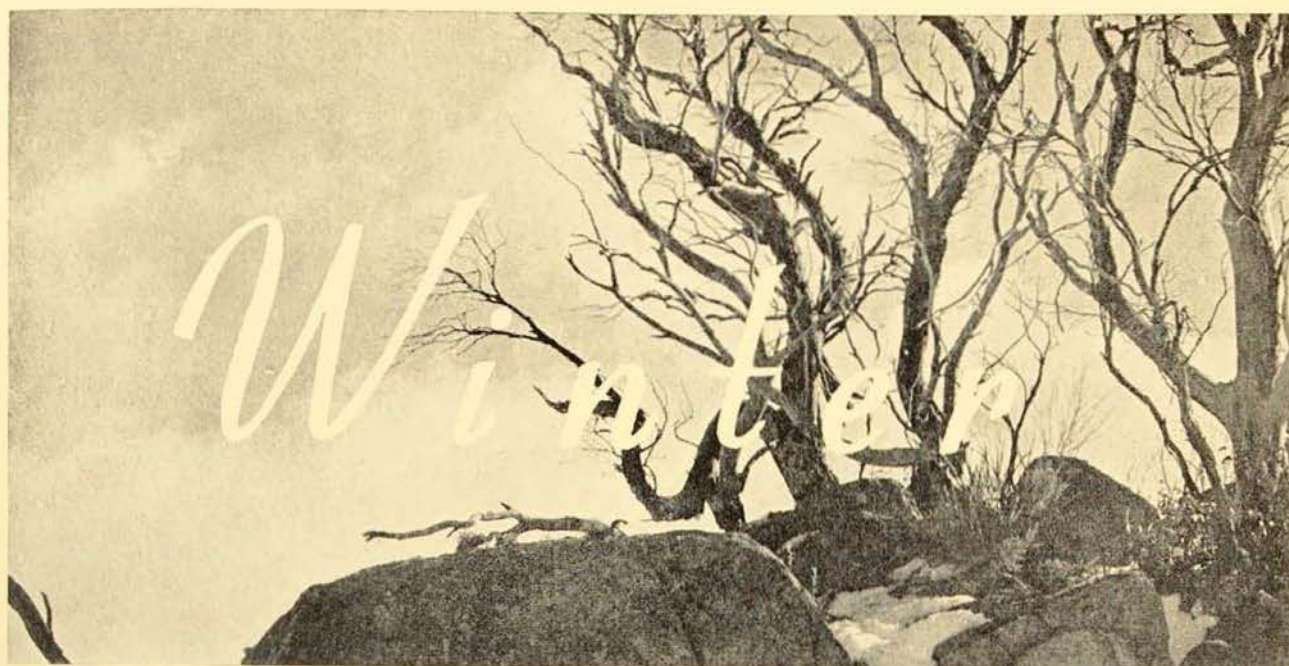
<sup>1</sup>Musgrave, A., "Harmful Moth Caterpillars", Vol. VII, No. 11, 1941-42.



The yellow and black Day-flying or Grape-vine Moth, *Phalaenoides glycine*, one of the first insects to appear in the spring, but disappears when autumn approaches.

Photo.—A. Musgrave.





The winter months for Australia, June, July, August, bring a time of peace for insect life, and the bush is subdued, so far as southern latitudes are concerned, during this period. The more tropical parts of Australia recognize only wet and dry seasons, or the monsoons. Nevertheless, in the bush about Sydney, many forms are on the eve of emerging from their hiding places under logs, stones, or the bark of trees, where they have wintered in one of the early stages or even as adults. Upon the Australian Alps, at Mt. Kosciusko or other high altitudes, snow may fall and persist as drifts far into the summer. Yet even at Mt. Kosciusko, with its blizzards and zero temperatures, insect life exists under bark or among the grass tussocks.

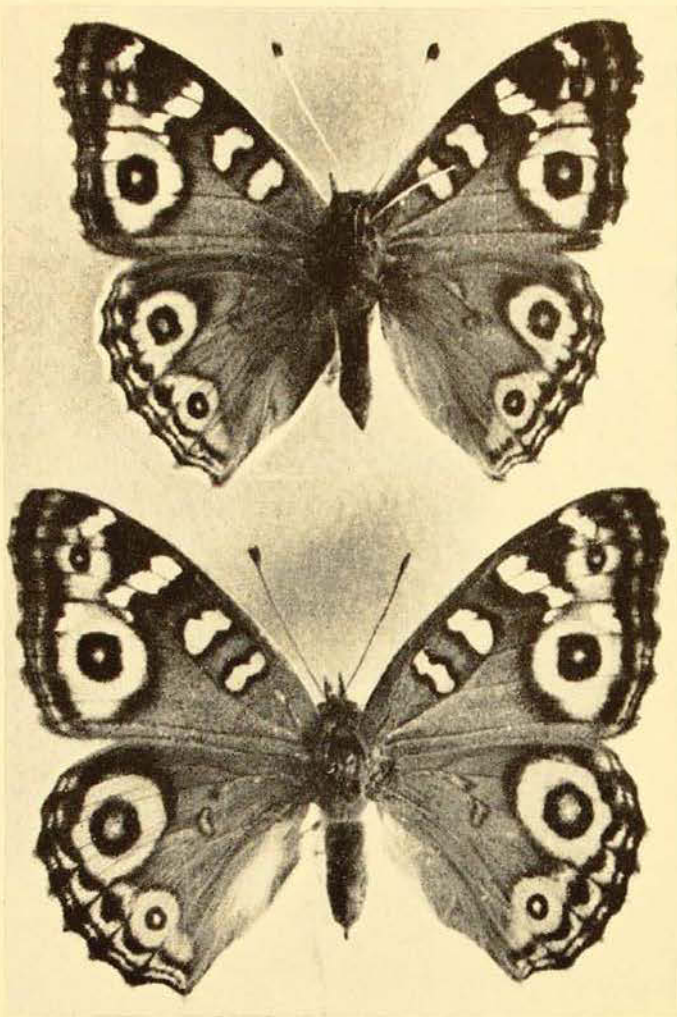
It is interesting to note that the best time of the year about Sydney for collecting the small insects found in ants' nests, is the cold period from June to September. No less than thirteen families of beetles are recorded from ants' nests in the Sydney district; these are said to be parasitic upon the ants. One interesting genus of ants' nests beetles is that called *Chlamydopsis* and which is included in the family Histeridae. Many new members of this genus were described in the past by the late A. M. Lea, formerly Entomologist to the South Australian Museum. At this time of the year the ants are found nearer the surface of the ground, perhaps as a result of being flooded out at the lower levels or else the warmth of the ground

above attracts them. This may explain why the collecting of these beetles is an easier task during the winter. Some of these ants' nest beetles are among the smallest in the world, particularly those of the family Trichopterygidae, and may range from .5 to 1 mm. in length, while in other families we find giants of 4 mm.

Though the wintry blasts of the "roaring forties" have long since disposed of the majority of the insects, there is one butterfly of the Sydney district whose fortitude cannot be shaken, the Meadow Argus, *Precis villida calyce*, our commonest species, and which may sometimes be found at this time of the year sunning itself. It has a wide range over Australia, as well as the South Pacific Islands, and about Sydney it is with us practically throughout the year as occasional specimens are seen in June and July. The larvae feed on a number of garden plants such as Plantago, Snap-dragon, Australian Centuary, and Verbena.

About the middle of August we begin to note that "the hounds of Spring are on Winter's traces", for suddenly the weather breaks, and the mercury, which has been oscillating about the 50° F. mark, now begins to show a marked preference for the region of about 60° F. Some of the fruit trees are already in blossom in July, and, in the bush, the first of the Epacrids to appear is the spiky-leaved *Lysinema pungens* which ranges over the sandstone





country from Illawarra to Queensland. Its white or reddish flowers are sessile or stalkless in the axils of the upper leaves. This slender erect shrub is quite a beautiful object when it occurs in masses. About Adelaide during August the introduced Sour Sob, *Oxalis cernua*, imparts a golden sheen to the landscape; this plant, however, is responsible for many deaths in sheep owing to its oxalic acid content.

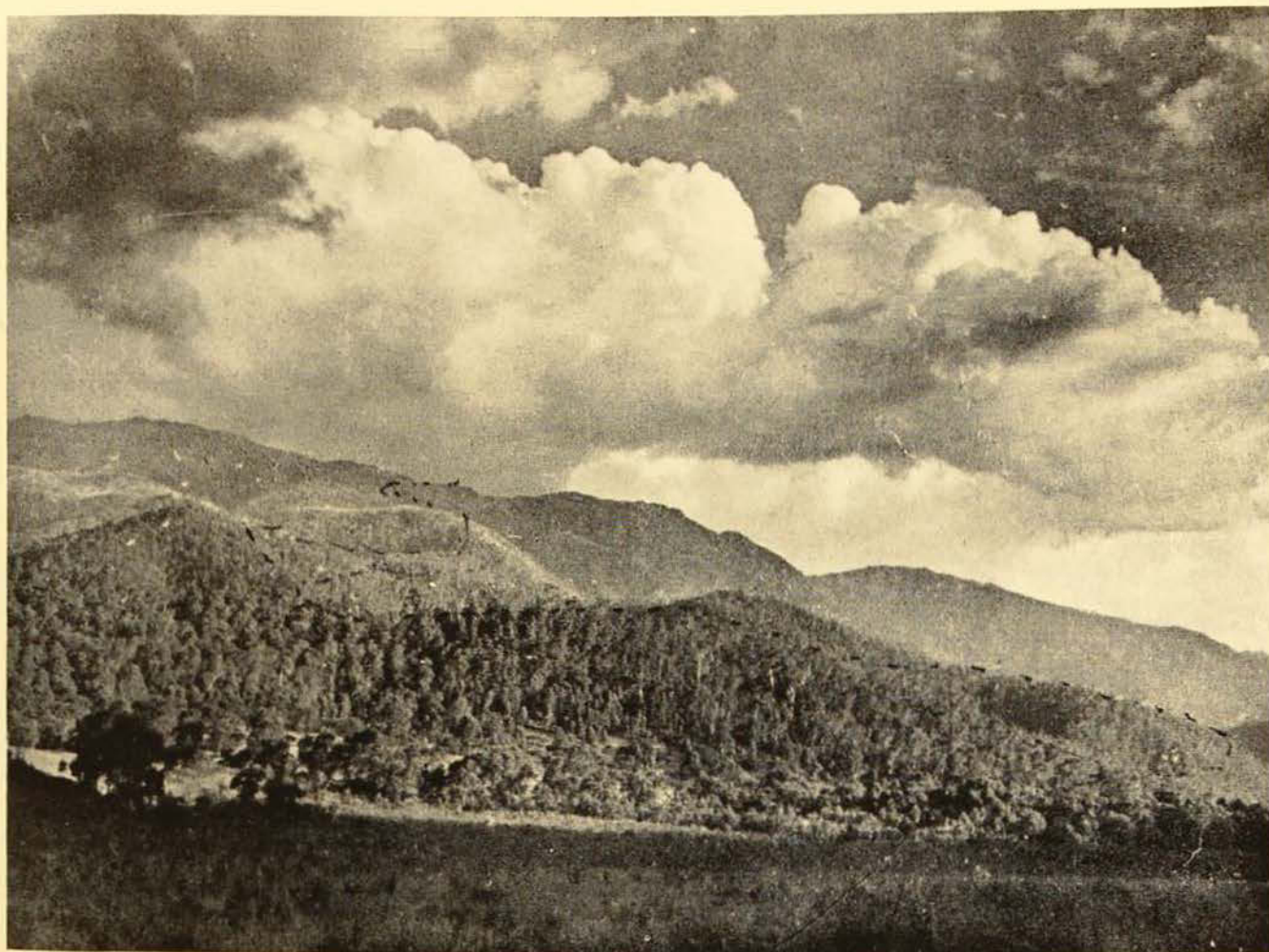
The Cootamundra Wattle, *Acacia baileyana*, is also one of "the flowers that bloom in the Spring, tra la". Its small golden-yellow flowers, short, bipinnate leaflets, and flat, broad seed-pods, serve to identify it from its many allies. Its yellow flowers have strewn the streets of suburbia long before the 1st of September announces that Spring has again been officially ushered in, and we realize that we have again completed the cycle of the seasons whose yearly round make up an Insect Calendar.

The Meadow Argus, *Precis villida calybe*, a widely distributed Australian Nymphalid butterfly, and a hardy insect which may be seen about Sydney even in the winter months.

Photo.—A. Musgrave.







Clouds over the main range of the Snowy Mountains. The highest point is Mt. Townshend (7,249 ft.) taken from the Geehi River (1,400 ft.). The marked track follows Hannel's Spur and is a well used stock route.

Photo.—M. Hall.

# The Snowy Mountains of New South Wales

## Part II

### SEDIMENTARY ROCKS AND THEIR CONTAINED FOSSILS

By H. O. FLETCHER

A VISIT was recently made to the Snowy Mountains with the object of determining the geological age of the extensive outcrops of sedimentary rocks. These consist mainly of very altered shales now forming slates and cherts and in a search for fossil remains many outcrops were systematically examined in the country west of Cooma, the Snowy Plains area and in the mountains near the Tumut gorge.

Fossil remains in the form of graptolites had previously been discovered near Cooma

and these indicated that the sedimentary rocks were of Ordovician age and were deposited approximately 500 million years ago.

Graptolites are interesting colonial animals which came into existence in late Cambrian seas. They flourished to an amazing extent in the succeeding Ordovician times and spread to all parts of the world. Although they persisted into the Silurian geological period they were not represented by a great variety of species and very soon became extinct.





*Left:* Mt. Twynham (7,207 ft.), one of the major points on the main range.

Photo.—C. Adamson.

*Right:* Mt. Tate (6,789 ft.), 4½ miles north of Mt. Twynham on the main range.

Photo.—C. Adamson.



Graptolites were the dominant form of animal life in the Ordovician seas and, at the close of that geological period had been dispersed to all parts of the world. Their rapid dispersal and wide distribution was made possible because they were free-swimming or floating organisms or in some cases attachment to drifting sea-weed and other objects was the means of distribution.

Graptolites have been considered by various authors in the past to be plant remains, sponges, Cephalopods and Bryozoans, but are now generally accepted as being very closely related to the Hydrozoa. In general form a graptolite colony consists of an elongated, tubular polypary of a chitinous nature, usually linear and undivided but maybe branched. The enclosed organism within the polypary or skeleton consists of numerous polyps which are housed in cup-shaped hydrothecae developed on one or both sides of the polypary.

When found in the fossil state graptolites appear as long flattened impressions on the bedding plane of the shale in which they were embedded in Ordovician times. The undivided species look like saw-blades with the edges toothed. The blade is the remains of the polypary or chitinous skeleton while each notch on the toothed edge or edges represents one of the small cups or hydrothecae which each housed a single member of the colony. Some graptolites are found in large groups with their proximal ends attached to a central body which may have been a gas-filled chamber or float similar to those of the living Portuguese Man-o-War or "Blue-Bottle".

The great number and variety of graptolite species found in Ordovician sedimentary rocks has made them a unique group for zoning and correlating the Ordovician sequence. This has been done to a marked degree in Victoria and New South Wales, although in the latter rocks only of Upper Ordovician age have been found.

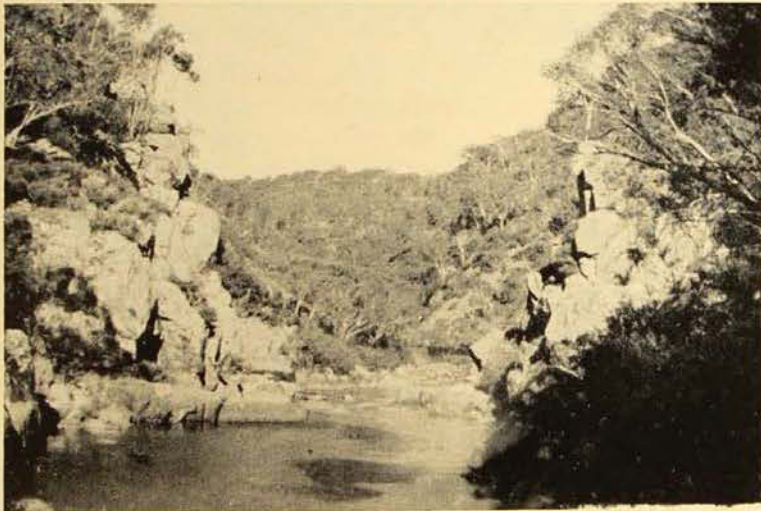


The first graptolite remains to be recorded from Ordovician rocks in the Snowy Mountains area were from a locality about two miles westerly from Berridale. These were found in 1908 and, in the following year, additional specimens were collected from a black slate at Wambrook Creek where it crosses the Adaminaby Road, 11 miles from Cooma. The material consisted of genera such as *Diplograptus*, *Climacograptus*, and *Dicellograptus*, which indicated the age of the rocks to be Ordovician. Four miles to the N.N.E. of the Wambrook Creek locality other badly preserved graptolites were found at McCarty's Crossing, near the junction of Bridle Creek and the Murrumbidgee River. A further locality 2 miles from Berridale is also of importance because of the occurrence in the slates of an abundance of the graptolites *Diplograptus*, *Didymograptus* and *Tetragraptus*.

Several of these localities and other new horizons in the vicinity of Cooma and Berridale were visited in the preliminary

work in this district and additional collection of graptolites were made. These graptolites were of Upper Ordovician age and it was found that two zones were represented which could be correlated with the *Climacograptus wilsoni* zone (lower horizon of Eastonian of Victoria) and the *Dicanograptus clingeri* zone (upper horizon of Eastonian of Victoria). The main objective, however, was to examine the rocks farther to the west in an attempt to find graptolites and determine whether they were of the same age and continuous with those of the eastern area.

Some time was spent in examining the sedimentary rocks in the vicinity of the Snowy Plains and Nimmo Mountain. To reach the Snowy Plains it is necessary to turn left off the main Jindabyne-Adaminaby road about 13 miles before reaching Adaminaby. The Snowy Plains road then leads downhill for about a mile into the valley of the Eucumbene River and this fast-running and wide river is crossed by means of a good wooden bridge. Upstream



Left: The Tumut River, two miles below Fifteen Mile Crossing. The gneissic granite forms bold outcrops.

Photo.—C. McElroy.

Right: "Seaman's Hut" on the road to the Summit with part of the Etheridge Range in the background.

Photo.—C. Adamson.





can be seen glimpses of the Nimmo Plains, but the Snowy Plains track continues straight on over the Nimmo Mountain. The track is steep in places with a rough surface of upturned edges of strongly silicified slates. Before reaching the summit of Nimmo Mountain, 4,876 feet in height, the track branches, but each branch leads to the Snowy Plains, the left one to Weston's Hut and the other to the Gungarlin River about one mile north of the hut. This latter track has a very steep descent to the river which can be crossed fairly easily by a "Jeep" or "Land Rover".

The Snowy Plains is a beautiful area of the "uplands" and, during our visit in November, 1950, was covered with Snow-daisies and other sub-alpine flowers. In the distance and away to the south was the snow-capped Main Divide, near Mt. Kosciusko, while nearer at hand were the majestic peaks of Jagungal (6,758 feet) and Bull's Peaks (6,180 feet).



Negotiating swampy areas on the Snowy Plains. Deep but narrow swamp gutters are bridged with planks.

Photo.—C. McElroy.

Through the valley of the Snowy Plains runs the Gungarline River on its way to swell the waters of the Snowy River. At this point it is a magnificent mountain stream with a good supply of fast-running water and, even after slight showers of rain, rises considerably in height. It abounds with Rainbow Trout (*Salmo irideus*) and this river, although rarely fished, would be a paradise for rod fishermen.

A good deal of geological reconnaissance work was carried out during our two

weeks' stay in this area. Our investigations extended from Bull's Peaks to the Eucumbene River and most of the sedimentary rock horizons were critically examined for graptolite remains. A great belt of sediments extends for three or four miles in width between the Eucumbene and Gungarline Rivers, and is traversed by the Snowy Plains track. Much of this belt consists of highly altered quartzite and it rises to a height of 1,200 feet above river level with the Nimmo Trigonometrical Station (4,876 feet) as its highest point. Although examined exhaustively no fossil remains were found over the whole of this area with the exception of a small patch on the southern edge. The graptolites at this locality on the eastern bank of the headwaters of Bundara Creek, an east flowing tributary of the Eucumbene River, were collected very close to a contact zone with the granite and naturally were not in a good state of preservation. None could be identified satisfactorily, but sufficient evidence was provided that the sediments were of Upper Ordovician age and could be correlated possibly with the sediments of the Cooma area.

The sedimentary rock outcrops were examined in the vicinity of Adaminaby and Kiandra.

A continuous search was being made for graptolite remains in any sedimentary outcrops on the road-side and at several black slate deposits near the township, but with no success. The extreme alteration to which these rocks have been subjected caused them to split readily along the shearing planes rather than the bedding and, as a result, the finding of graptolites would be fortuitous.

Shortly before reaching Kiandra the party turned off the main road and proceeded along the newly made road to Tumut Ponds. This road, although still under construction, is nearing completion and it is so well surveyed that the gradient into the Tumut Gorge, a drop of about 1,500 feet in a very short distance, is at no time a steep one. Work on the Snowy Mountains scheme is proceeding rapidly at Tumut Ponds and a great deal of necessary preliminary work has been



completed. Graptolite remains were recently found in a bore-core at this locality and they proved the age of the rocks to be the same as those farther to the east.

Leaving the made road at the top of the Tumut Gorge and striking our way across the main range towards Happy Jack Plains, we realized the worth of the "Jeep" in negotiating rough mountainous country. During the journey considerable time was devoted to an examination

of all sedimentary rocks in our search for fossil remains, but with no marked success.

A large area of country was traversed on the complete journey and important palaeontological finds were made. The sedimentary rocks are so extensive, however, that the work carried out in such a limited amount of time must be considered as a purely preliminary palaeontological survey. No doubt further fossil evidence will emerge from more detailed work.

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## A Notable Aboriginal

Douglas Grant, a full-blooded Queensland aboriginal who had been an inmate of the War Veterans' Home, Bare Island, La Perouse, near Sydney, died on 4th December. His actual age was not known but it was generally considered to be about 69 years.

He was an interesting example of the effect of environment and assimilation into the white community. This Museum, indirectly, perhaps, was interested in him. For Robert Grant\* and his wife in 1887 were collecting for it in the Bellenden Ker Range, north Queensland. Happening on the scene of a tribal clash they found him abandoned—in all likelihood his parents had joined their forbears—for Robert Grant's account indicated that the engagement had been fierce. The Grants took him up, he was little more than a toddler, and reared him as carefully as if he had been their own child; later they had a son and the boys were as brothers. Douglas was particularly intelligent. He was educated at the Annandale Public School where he easily held his own with other scholars, frequently heading his class. Upon leaving school he was trained at Mort's Dock as

an engineering draftsman and between here and the Lithgow Small Arms Factory he followed this profession. He served in the 1914-1918 war (13th Battalion), fighting in France where he was taken prisoner and placed in a camp for ghurka prisoners. Here a visit from Professor Hermann Klaatsch, an eminent anthropologist who had met Douglas during a visit to Sydney in 1905, proved fortunate for, on his representations it is believed, Grant was transferred to another camp with Australians with whom he had a common interest. On his return to Australia he resumed his calling, at times following other pursuits. For a considerable period he conducted the returned soldiers' session on radio station 2LT, Lithgow.

He was not only a skilled draftsman. He was an excellent penman, a conversationalist with a keen sense of humour, well informed and well read, and friends of a lighter hue appreciated his company.

—W.A.R.

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\*Robert Grant collected extensively for this Museum in the '80s and later was appointed taxidermist; he retired in 1917. His son, Henry, was taxidermist from 1909 to 1943.





The head of a Wondjina painted in a cave in the territory of the Worora tribe near the Glenelg River in the Kimberleys. These huge mouthless figures wear a striking headdress. They represent the spiritual ancestors of the totemic clans.

After J. R. B. Love.

## Aboriginal Rain-makers and Their Ways

### Part II

By FREDERICK D. McCARTHY

THE use of crystals of quartz, calcite or gypsum was common in rain-making rites. In the Turrbal tribe of Brisbane, for example, the rain-maker spat into the air, took a magical *kundri* stone from his mouth, and chanted his appeal for rain, chiefly to increase the supply of yams and bunya-bunya nuts. To stop the rain, which fell for four days after one performance, a rain-maker threw fire-sticks into the air, growled loudly in his throat, and displayed his magical *kundri* stone again, when the weather cleared. The Mai-orli of western Queensland set three crystals in gum on a stick which was fixed in a hollow log under the water; the stick

was removed when the rain came. The rain-maker on the Georgina river to the north threw powdered quartz crystals over the women who caught them in wooden bowls, and the men also imitated the actions of aquatic animals. Dieri men, after finding a suitable piece of gypsum, sat in pairs with a bowl of water containing also pointed emu bones. Each man in turn inserted the bones through flaps of skin on his arms and legs, and the blood was drunk from the bowls afterwards. The crystals are the source of the magician's powers in many parts of Australia, and he obtains them from his tribal ancestral beings, such as the sky heroes of eastern



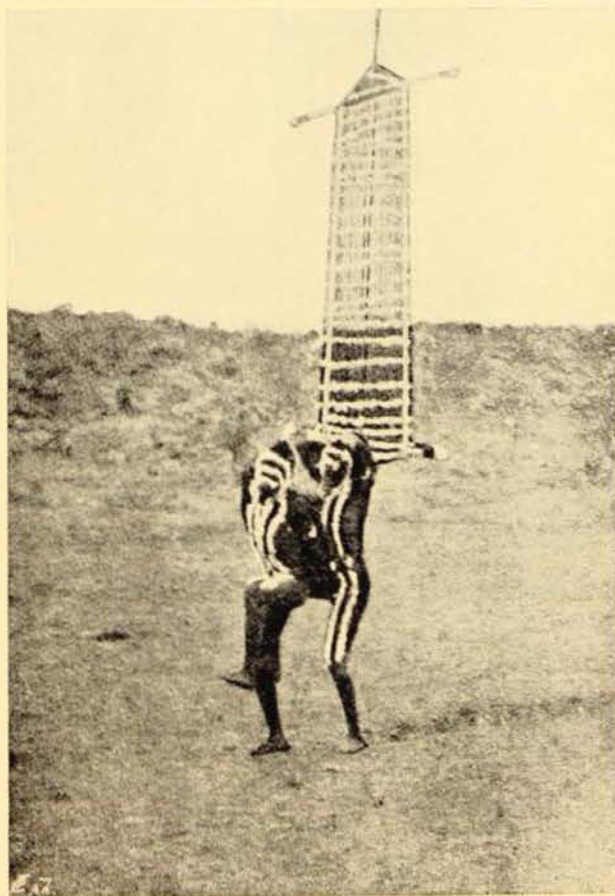
Australia—Baiami, Daramulan, and the like—and from the great snake and other ancestors of north Australia, with whom only the medicine-men through the spirit-messengers are allowed to hold intercourse. Crystals impregnated with such powers are dangerous to the younger generation and are obtained and handled by the headman of a local group or by the medicine-man.

Tribes on the Darling River of New South Wales mixed powdered gypsum with hairs from a man's beard and blood from his arm into a paste, which they placed between bark and set under water with stakes; rain was expected when the paste dissolved. Among the desert tribes of Ooldea scrapings from the edge of a pearl-shell (traded from the Kimberley coast) is mixed on a stone with fresh grass chewed by the rain-maker; his companions sing the appropriate songs and each takes a little of the mixture. Another use of pearl-shell by these natives is in the *Inma* rite in which several men wear one into the bush where they chant and seek to attract the rain, which lives in the west, by the shiny shells and by the beckoning of the rain-maker. A thanks-giving ceremony is held at night. The burning of human hair was a rain-making rite upon which great reliance was placed in Victoria and at Cape Grafton in Queensland.

One of the most powerful sources of magical power in Australia is the Rainbow-Serpent, and his aid is sought in producing rain by many tribes. On the Forrest River in the Kimberleys he is known as *Galeru* and in the words of Dr. Kaberry his coils are "charged with the power that is the source of human life, of magic, and of the fertility brought to the earth by the rains." In the rain-making rite the headman of the local group obtains the magic crystals from *Galeru*, breaks them up and wraps them in a grass bundle to be put into a waterhole. In the coastal tribes of Queensland the medicine-men cut the base of the Rainbow at the bottom of a river, from where they brought up the magic crystals, to cause heavy rainstorms. The medicine-man of the Murngin of north-eastern Arnhem Land stops a flood by

diving into the water, catching the great python by the tail and sending him back to his under-water home, when the waters recede.

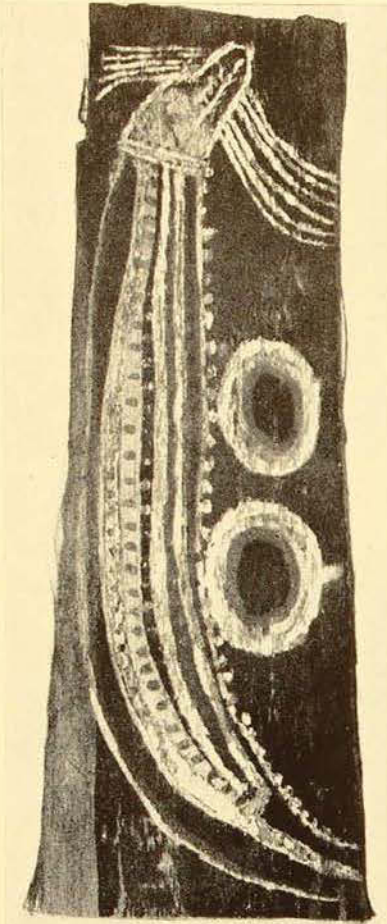
Among the Aranda of Central Australia the water totem is a district known as *Kartwia kwatja*, the rain country, fifty miles east of Alice Springs. To its members the secret of rain-making was given in the dream-time, the *Altjira*, by *Irtj-woanga*, an ancestral being. The leader of the clan assembles the other members and invites other men to view the ceremony. The performers are decorated with paint and featherdown in several different designs. They go out hunting but do not drink. The old men build a hut in which the younger members lie most of the night. At sunset they decorate the leader in an elaborate fashion, bands of down on his forehead representing the rainbow. He sits in the hut while the old men sing rain



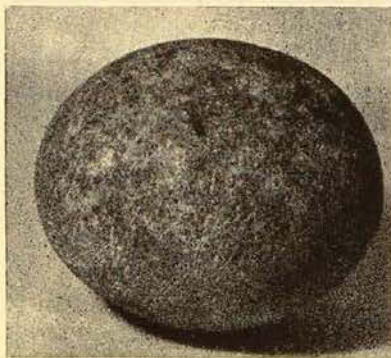
Aranda men of the water totem carrying the sacred *wananga*, their symbol of water, during an increase-rite to bring rain to stimulate plant and animal life and to replenish the water supplies.

After W. B. Spencer and F. J. Gillen.





Above is shown a bark painting of the Rainbow Serpent *Ngaliot* from Fish Creek, Oenpelli district of western Arnhem Land. The two eggs are shown in the painting, and one of the pebbles representing them is shown below.



songs, then walks up and down a trench 30 yards long quivering his body and legs in a remarkably vigorous fashion while the young men arise and join in the singing which continues throughout most of the night. This performance is repeated at intervals during the night, and at the end of the ceremony the young men rush out of the hut uttering the cry of the spur-winged plover.

I obtained a stone called *wi'lak*, one of the two eggs of the Rainbow-serpent, a huge snake called *Ngaliot* who lived in Fish Creek, about fifteen miles from Oenpelli in western Arnhem Land. In the dream-time *Ngaliot*, who made the country, came from the East Alligator

river, about 25 miles to the south-east, across to the rapids where Fish Creek emerges on to the plain from the rocky plateau, and then took up his abode in the pools below. Here he laid his eggs, and still lives. The dream-time people saw the eggs in the sand, but they had to build a fire all around them and pass their hands through it before they could touch them. The eggs were then put on a ledge in a small rock-shelter about one hundred feet above the creek on the southern bank. There are a few faded X-ray and monotone paintings in the shelter. One of the eggs disappeared but the natives could not explain when or why or by whom it was taken away. The members of the totemic clan concerned talked to *Ngaliot* and promised to look after the remaining egg, although the site is not used now for rain-making. To make rain the old men of the totem painted the egg on one side with the appropriate design, rubbed it, and uttered magical phrases over it to bring the rain at the end of the dry season. They also requested *Ngaliot* to stop the rain in the wet season when they did not want any more. A big flood would cover the land if they knocked this egg down with another stone and broke it into pieces. The egg was looked after by a guardian for



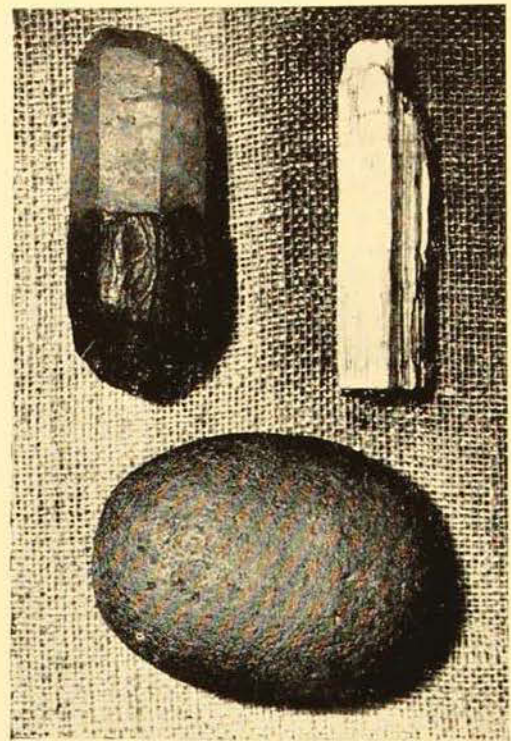
This design is worn by the natives at Milingimbi in Arnhem Land at the end of the dry season when rain is desired and the rain-making rites begin.

Photo.—D. McCarthy.



whom it also acted in the same capacity. When the guardian died his clansmen put the egg into the freshwater creek and the new guardian took it out and back to the rock-shelter. When it was given to me by its guardian, *Na:gaulu*, he was a very old man with no son to succeed him. I was instructed in the gravest terms to look after it very carefully, and to hand it on to my eldest son—the natives were relieved and pleased to know that I had a son—and further that it must not be put in saltwater. The egg is a waterworn boulder of grey quartzite, 5½ x 7 inches in size.

Professor Elkin ascertained that the primary significance of the great mouthless anthropomorphs known as *Wondjina*, painted in rock-shelters by the Ungarinjin, Worora and Unambal tribes of the Kimberleys, is the power that makes or is in rain, the regenerative and reproductive power in nature and man. These ancestral beings are responsible for the production of human baby spirits, and for the increase of natural species used as food and for other purposes. The head of a *Wondjina* is retouched with paint when rain is required, usually at the end of the dry season but sometimes during this season also. One local group of the Ungarinjin tribe, the Kalarungeri horde, has rain for its totem, and its leader need only dream that he has visited the *Wondjina* and retouched it to bring on the rain. *Wondjina*



Magic Stones. Top right is a piece of gypsum used in rain-making rites at Mount Poole, New South Wales. Top left is a quartz crystal, covered with black gum on one end, from Cairns, Queensland, of a type used in rain-making rites in many parts of Australia. At the bottom is a pebble from Lake Eyre, Central Australia, used for magical purposes.

is also associated with *Ungud*, the Rainbow-serpent, which may be the former's mate or totem, and which takes *Wondjina*'s place in some localities as a source of rain.



## Review

GEOGRAPHY IN THE 20TH CENTURY, A study of Growths, Fields, Techniques, Aims, and Trends. Edited by Griffith Taylor. (New York: Philosophical Library.) (630 pages, over 50 text figures. Published 1951, in the U.S.A. by the Philosophical Library, Inc., 15 East 40th Street, N.Y. And in Great Britain by Methuen & Co. Ltd., 36 Essex Street, London, W.C.2. Price \$4.75.)

The title and sub-title of this book suggests that there will be an assessment of the progress of geographical thought in the twentieth century, although it is but half spent.

I am of the opinion that no knowledgeable geographer, having read the book, would agree that it fulfils this aim. Many of the best essays are not geographical at all, though delightful to read and accurate in fact, for example, F. K. Hare's "Geographical Aspects of Meteorology"; while some have been more flippant, for example, Professor Wooldridge writing on "The Progress of Geomorphology", ends his essay with the statement that:

"The geographer cannot take landforms as given without intelligent scrutiny of their genesis, any more than the chemist can rest content with molecules and ignore the worlds of atomic and sub-atomic physics. It is perhaps the geographer of 'humanist' proclivities rather than the geologist who needs to take 'straight upon the chin' these forceful words of Davis." (P. 176-177).

I think the Editor might have deleted that paragraph with advantage to the writer.

There is an interesting article on "Soils and their Geographical Significance" by D. F. Putnam. However, if soil is to be dealt with as an aspect of environment, it will not be through the language of soil science, however suited that may be to the science of the soil, but as a product of the end-point of denudation.

So the main criticism one has to offer of this book is that the writers, while contributing very interesting articles in themselves, have not represented their subject as geographers see it, and there are many omissions of geographical writers who are more fitted to present such a case.

There seems to me an overcrowding in certain aspects of knowledge related to Geography, thus distorting the true trend of geographical studies.

The Editor states that "one of the most recent branches on the geographical tree is that known as geopolitics". He would be more correct to say that geopolitics and geopacifics are parasitic growths which no one except a parasitologist could have any interest in reading, and which certainly should not be included in a good book on Geography.

Australia and New Zealand deserved very much more attention in this book, especially from the Editor who had visited these parts only very recently.

I cannot agree that this is a good book for geographers or for their friends, though it is not without some good reading.

—J. MACDONALD HOLMES.

