SUMMER 1992-93

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ELIZABETH GOULD
Nature's Unsung Heroine

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Who's the Victim?

KOALAS & TREE-KANGAROOS
Demanding Hard Decisions

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Up Front

Koalas and tree-kangaroos often exist in small, isolated colonies with greatly fluctuating populations. Now that their numbers are no longer curtailed by hunting, some colonies are faced with serious overpopulation problems. Unfortunately managing them isn't as simple as relocating colonies, so conservation managers face some tough decisions.

CARL BENTO / AUSTRALIAN MUSEUM

Mike Gray studying a funnel-web.

Which spiders do you fear most? Odds on it's funnel-webs. Do you stomp on your shoes before inserting your foot or carefully check the bottom of the pool in case one lurks there? These spiders are often accredited with legendary powers, so we sent funnel-web expert Mike Gray on a myth-breaking mission. Working directly across the corridor from him has its moments, as sometimes on particularly hot days, Mike has cooled off his heat-stressed subjects by putting them in our fridge!

Another summertime paranoia is the fear of sharks. These maligned creatures are detested and feared by people, yet we are more likely to be killed by a lightning strike than a shark! Indeed, people are a greater threat to sharks—for every person killed by a shark over 23 million kilograms of sharks and rays are killed by people.

Also in this issue we look into the life of the talented but unrecognised Elizabeth Gould, who did most of the illustrations for John Gould's famous books; we find a platypus in South America, take a bird's-eye look at Australia with a pilot-turned-photographer Lindsay Stepanow, and learn about the potentially lethal hitchhikers in ship's ballast water.

Lindsay Stepanow: self portrait.

—Fiona Doig & Georgina Hickey, Editors

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Front Cover
Many people are campaigning to 'Save the Koala', but conserving small patches of habitat can lead to overpopulation within colonies. As relocation is not always wise or possible, conservation managers face some tough decisions. Photo: L.F. Schick.

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LETTERS

The forum for readers to air their views about their concerns, past articles and interesting personal events.

Passover: the Woman's Role

I read with interest your QQC report on research into deferment of death until after important occasions (ANH Autumn 1992).

I wish to challenge the basic assumption of the researchers that Passover is more important to Jewish men than to Jewish women. It is true that, in orthodox or religious families, the man has responsibility for many of the important ceremonial functions connected with Passover. However, the equally important role of women has been disregarded.

The Passover Seder (or ceremonial meal) consists of two essential components: the ceremony, which is traditionally conducted by the senior male member of the family; and the meal, which in both traditional and modern families is generally the responsibility of the woman. The meal is not merely an optional extra—it is an essential and equal component of the evening's festivities. In less religious families, the meal becomes more important than the ceremony, which may be allotted only 15 minutes in a three to four hour family gathering.

RICHARD NOWITZ

Passover: the women's contributions should not be overlooked.

The Passover meal is very special and even the poorest Jewish families will attempt to provide a substantial repast. A typical Seder meal in a family with Ashkenazi origins will comprise the following: chicken soup and kneidlach (dumplings)—approximate preparation time, three hours; gefillte fish, five hours; meat and vegetables, three hours; matzah pudding, two hours. A total of 12 hours preparation time (excluding time spent shopping for ingredients) constitutes a major input into the festival. In addition, the woman of the house has responsibility for preparing the ceremonial platter (shown in the illustration) and for setting the table and for serving food on the night.

In orthodox families, there is a requirement that the whole house is thoroughly cleaned before the Passover and that all crockery, cutlery and cooking utensils are replaced with special ones used only during Passover, and that the everyday kitchenwares are packed away; or if a complete replacement set is not available, special cleaning of each item must take place to purify it for the Passover. All this is generally women's work. Approximate time spent cleaning and cleansing would be about three days.

These are not merely peripheral aspects of the Passover; they are central and integral to this important festival.

The assumption that Passover is of more significance to Jewish men than to Jewish women is simply not correct. The results of Phillips' and King's research must be brought into question, because one of their most important basic assumptions does not stand up to examination of the facts. If there is indeed a difference between male and female mortality rates after Passover, the causes must be sought elsewhere.

—Bernice Cohen
Norwood, SA

Sawflies and Pollination

It was with interest that I read Philip Weinstein's article "Undermining spitfire defence strategies" (ANH Summer 1991–92), but I was horrified with his suggestion for using the parasitic wasp *Taeniogonalos venatoria* to control sawflies. Comments such as this are frightening and throw doubt on the author's understanding of ecology, regardless of his qualifications.

The sole pollinator of our fascinating Flying Duck Orchid *(Caleana major)* is a sawfly species with a flightless female *(Lophyrotoma leachii)*. The orchid mimics the female sawfly shape and also releases copycat scents to attract the male.

Under normal circumstances this particular species mates on the wing. The male plucks the female from a grass stem, flies into the wide blue yonder and, after completing copulation, places her back down at ground level where she can lay her eggs. The larvae, when hatched, form that repulsive writhing mass of 'spitfires'.

The Flying Duck Orchid takes advantage of this procedure. The excited male grasps the 'head' of the 'duck' and tries to fly off. The ingenuity of nature then enters the game.

The irritable 'head' is attached by a stalk to a flat strap. The momentum of the sawfly holding the 'head' as it flies, swings it down and into the 'body' of the 'duck' (the flower). Here it is pressed firmly, upside-down, probably temporarily stunned, against the column while the pollen grains are stuck to the sawfly's back, before being released.

The gullible insect then flies off to hopefully repeat the mistake with another Flying Duck Orchid, this time depositing the pollen from its back onto the next flower, thus achieving pollination.

Upsetting the current balance by increasing the parasitic wasp population to control sawflies would, in the long run, account for the demise of another of our wonderful native orchids. Biological controls are to me only acceptable when both predator and prey are exotic and specific.

—Reg Angus
Dee Why, NSW

In considering the potential impact of the wasp Taeniogonalos venatoria *on populations of the sawfly* Lophyrotoma leachii, *Mr Angus has overlooked several fundamental and obvious facts about the biology and ecology of these species. Both species are endemic to Australia, and if* T. venatoria *were capable of parasitising* L. leachii, *it is likely that it would already be doing so. However,* T. venatoria *has never been recorded from* L. leachii, *nor is it likely to be so in the future. There are many reasons for this; the more obvious ones include habitat, behaviour and population dynamics.*

This wasp species is found in inland New South Wales, Australian Capital Territory, Victoria and eastern South Australia. On the other hand, the sawfly Lophyrotoma leachii *is found in coastal New South Wales, Queensland and northern Northern Territory. The*

JEAN-PAUL FERRERO / AUSCAPE INTERNATIONAL

The Scaly-breasted Lorikeet underwent a dramatic change in Williamson's play.

rainfall, temperature and vegetation differences between these areas of distribution are unlikely to favour the survival of either species in an area where the other is found. The wasp obviously cannot parasitise a sawfly species that is geographically removed from itself, no matter how many there are!

This wasp is a poor flier, and oviposits predominantly in those trees nearest to where it emerges or is released. If it were introduced into a eucalypt plantation, as my article suggests, parasitism would be confined to those insect larvae that defoliate plantation eucalypts. The larvae of L. leachii *do not defoliate plantation eucalypts.*

When there is a large increase in the numbers of a pest species, this is usually because the pest has 'escaped', in time or in space, from the parasites and predators that normally keep the population in check. The parasites eventually catch up, but serious crop damage could occur in the interim. By introducing this parasitic wasp into populations of sawflies that do defoliate eucalypt forest (namely, Perga dorsalis*) before the latter reach outbreak proportions, one is merely advancing in time what would have occurred anyway.* Taeniogonalos venatoria *wasps would therefore not present a threat to* L. leachii *sawflies unless it were already doing so naturally.*

Specific exotic biological control agents clearly do not exist for endemic pests, and such pests can only be controlled by manipulating their natural parasites or predators. Insects and other invertebrates are too often neglected by conservationists, and drawing attention to their role as pollinators is one effective means of increasing awareness of their conservation value. When particular insects have clear conservation value, as does L. leachii, *it is counterproductive to refer to their larvae as "repulsive".*

—Phillip Weinstein
Australian National University

Name of the Game

The author of the letter regarding common names (ANH Autumn 1992) has many friends in agreement. Where birds are concerned, there had been an attempt in the past to improve the vernacular names of our birds with some success. The intention of this change was to make bird study more popular among lay folk and, in particular, children. The worst of the old book names were changed but there were still a number left as relics of the past.

In 1969 my brother prepared *An index of Australian bird names*, which was published by the CSIRO. Then the RAOU decided that a new vernacular names committee should be set up. Unlike the first committee the members were almost all professional scientists with little appreciation that vernaculars were used by lay people and encouraged them to enjoy our wildlife. Scientists use scientific names and have no problems. The new committee, being almost all scientists, treated their task as being an exercise in taxonomy.

At present there is confusion. My brother and I both tried to get a new vernacular names committee set up to create euphonius and more popular names where needed without success. Such a group would need to have a majority of those whose profession is writing and include at least one poet.

Who could use Black-faced Cuckoo-shrike in verse? And Scaly-breasted Lorikeet is so unpleasant that dramatist David Williamson changed it to Green Lorikeet in his play "Money and Friends". There are also Aboriginal names that might supply ideas. The RAOU should have another try.

—Vincent Serventy
Pearl Beach, NSW

ANH welcomes letters for publication and requests that they be limited to 250 words and typed if possible. Please supply a daytime telephone number and type or print your name and address clearly on the letter. The best letter in each issue will receive a $20 gift voucher from the Museum catalogue. The winner this issue is Bernice Cohen of Norwood, SA.

QUOTES & CURIOS

QUIPS

COMPILED BY GEORGINA HICKEY

Egg-beater in the Eye

All birds' eyes have a peculiar structure inside called the pecten, so named because of its comb-like folds. The pleated structure of the pecten bears some resemblance to an egg-beater or to the agitator in an old-fashioned washing machine. This comparison may sound bizarre, but recent work has shown that the pecten indeed functions as an agitator inside the eye, stirring its contents to aid the delivery of nutrients to a retina free of blood vessels.

The exact function of the pecten had remained obscure, despite hundreds of different theories and experiments aimed at revealing its role. It wasn't until Christine Wildsoet (Queensland University of Technology), Josh Wallman (City University of New York) and I teamed up to try and explain another puzzling feature unique to the avian eye that the picture became clear. Called saccadic oscillations, they rotate the eye back and forth rapidly around the axis of the pecten (20–30 times per second for 3–10 cycles, depending on the species of bird).

The pecten is packed with blood vessels with tiny pores allowing nutrients to escape toward the retina. However, in the absence of blood vessels to deliver nutrients to the far corners of the eye, these nutrients must diffuse long distances, up to two centimetres in the large eyes of birds. Such distances are too far for diffusion to be the sole means by which the retina's high metabolic demands are satisfied. This is where the saccadic oscillations come in. They evolved to enable the pecten to drive nutrients beyond the distances accessible by diffusion.

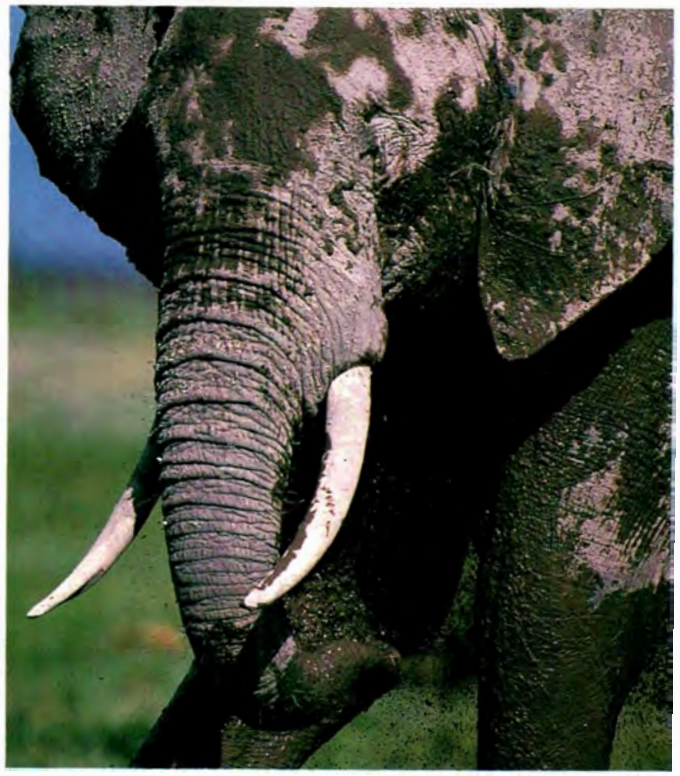
We recently visualised this process by injecting the green dye fluoroscein into the bird's circulation and taking a video of the back of the eye. A Tawny Frogmouth *(Podargus strigoides)* was the first subject because of its cooperative behaviour. This bird will sit still in its 'camouflage posture' while one brings a camera close to its eye. In addition, frogmouths do not blink very often, thereby allowing a much better view of the oscillations. The rapid stirring action of the pecten during a saccadic oscillation led to plumes of green, fluoroscein-stained fluid being distributed from the edge of the pecten, where it is secreted, to the far reaches of the eye.

The new findings help to explain why birds spend up to ten per cent of their total seeing time jiggling their eyes in a way that must make it difficult for them to see during these times. But this potential defect in their vision has a compensatory benefit. Because there are no retinal blood vessels in the bird's eye like those that disrupt the retinal image of mammals, birds can enjoy acute vision over a much wider field of view. In mammals, vision is most acute in the blood vessel-free area of the retina (called the fovea), but drops off quickly away from that area. In birds, the image quality is maintained over the whole field of view. Consequently, pigeons trained to scan the ocean for orange life support gear perform much better than humans in search and rescue teams because the pigeons do not have to move their eyes around. Similarly, my tame owl can detect out of the corner of its eye a tiny target in the sky, which is visible to me only after I have painstakingly managed to direct my fovea toward it by using the vague clues provided by the attention of the bird.

The Tawny Frogmouth is extremely obliging when it comes to studying its eyes. Inset: the pecten drives nutrients to the far corners of a bird's eye.

JACK PETTIGREW

—Jack Pettigrew
Vision, Touch & Hearing
Research Centre
University of Queensland



M.P. KAHL / AUSCAPE INTERNATIONAL

Slinging mud has its benefits.

Wrinkles Rule OK

To worshippers of baby-smooth skin, there could be few more abhorrent sights than metres of sun-tanned skin with wrinkles so deep you could lose a lizard in them. And yet, to elephants that sport such skin, those wrinkles are more precious than all the skin creams in Arabia. A study by Harvey Lillywhite and Barbara Stein of the University of Kansas has shown that wrinkles help the skin to absorb and retain precious water.

Because elephants lack sweat and sebaceous glands, to maintain body temperature they must regularly wet their almost hairless hides. If they have access to water, elephants bathe daily. When no surface water can be found, they are known to dig for subterranean water and, if all else fails, they use their trunks to withdraw regurgitated water from their throats. Elephants also coat their backs with mud, either by wallowing directly in mud or by spraying dirt over the wet hide to create a form-fitted mud suit. This natural spackle insulates the skin from direct solar radiation, which in turn significantly reduces dehydration.

Lillywhite and Stein made latex casts of the skin surfaces of African and Indian Elephants. These retained 4.5 to 10 times more water than casts made of flat surfaces, with water retention being greater in the casts of African Elephants (*Loxodonta africana*), whose skin is coarser with deeper folds, than those of Indian Elephants (*Elephas maximus*). When the skin casts were coated with mud and exposed to a warm dry atmosphere, they were found to retain moisture for about 23 hours (compared to 18 hours for flat casts). What's more, mud applied to the sculptured skin casts adhered throughout the drying period but mud applied to casts of smooth surfaces cracked into loose pieces and dropped off. Folds and wrinkles, it appears, enhance mud adherence.

Lillywhite and Stein believe differences in the degree of sculpturing between the African Elephant and its Indian cousin reflect the different habitats of these gargantuan beasts. African Elephants live in comparatively dry habitats where they are exposed to direct radiation in seasonally arid climates; Indian Elephants tend to inhabit forests at latitudes where exposure to direct solar radiation and dehydrating conditions is less. The researchers suggest that the principal advantage of the more closely textured skin of the African Elephant may simply be its capacity to grasp that age-old preserver of life and beauty—the mud pack. —S.H.

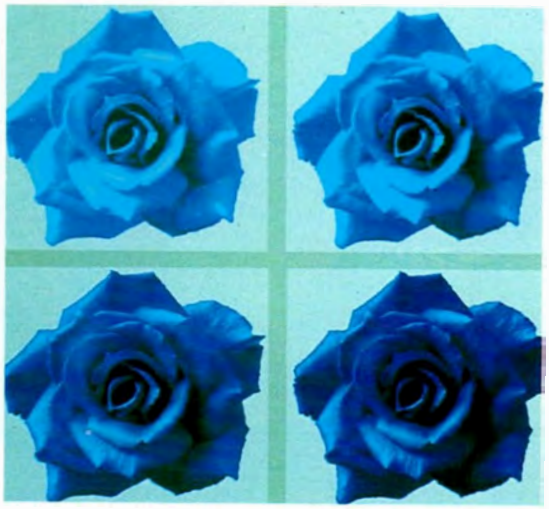
VIOLETS ARE BLUE, ROSES ARE . . .

. . . blue! Well, they could be soon. Roses come in rich red, soft pink, snow white, pale yellow, even grey or brown, but they don't come in any shade of blue. This is a major oversight on nature's part. Blue is a very popular colour.

It is impossible to produce a blue rose by conventional breeding techniques because roses lack the gene for making blue pigment. Researchers at Calgene Pacific, a biotechnology company based in Melbourne, are attempting to use genetic engineering to give roses the required 'blue gene'. If they succeed, they and the Australian flower industry stand to do very well. World sales of cut rose flowers net $US5 billion a year. The export potential for blue roses is enormous.

After several years' work, Dr Edwina Cornish and her team have successfully isolated the gene from petunias. Next they must transfer the petunia gene into roses. They will use a genetically modified bacterium to 'carry' the gene into the rose plant.

All things going well, the first blue roses will appear by late 1993. This will leave authors of etiquette guides with a problem. If red roses are for passion and white roses are for purity, what will blue roses be for? —C.A.



COURTESY CALGENE PACIFIC

J.N. LA ROQUE / AUSCAPE INTERNATIONAL

BLUE WHALE STRANDING

On 5 May 1992 a young male Blue Whale (*Balaenoptera musculus*), 18.7 metres long, was found dead on the beach at Cathedral Rock, five kilometres from Lorne in western Victoria. It was the Museum of Victoria's job to collect the animal whole, and prepare an articulated skeleton for display.

Salvage of the dead weight was a mammoth task. Bulldozers dragged it from the beach, three cranes lifted it onto a semi-trailer during the night, and it was transported to Werribee Treatment Complex where a work site and facilities were provided. A post-mortem was carried out but no definitive cause of death could be established. It was noted, however, that the blubber was very thin, about five centimetres compared to the usual 15. The carcass was stripped of its flesh, and further cleaning of the skeleton is continuing in a low-activity sewerage pond.

Not only will the prepared skeleton have great visual appeal, it will also provide important scientific information. In the early 1960s a small subspecies of the Blue Whale, the Pygmy Blue Whale (*B. m. brevicauda*), was described. While there are some criteria that may distinguish this from the traditional 'Blue', it is not an easy task. Could our specimen be a Pygmy Blue? Only careful study of the complete skeleton will tell.

—Joan M. Dixon
Museum of Victoria

Upsetting the Ballast

Several recent studies have shown that foreign marine organisms have been introduced into Australian waters as a result of ships discharging their ballast water as they take on cargo. Among the organisms are various species of fish, polychaete worms, molluscs, crustaceans and, most alarmingly, toxic dinoflagellates (planktonic single-celled algae).

The introduction of these foreign unwanted organisms is potentially a severe threat because, once released into our waters, they cannot be eradicated. A toxic algal bloom (or red tide) can cause paralytic shellfish poisoning in humans and can close down shellfish harvesting for many months. This would have severe economic repercussions for the aquaculture industry.

Although not a problem restricted to Australia, we are perhaps at greater risk than other countries because we are a net exporter of raw materials (iron ore, coal, grain, woodchips) and we thus receive an enormous volume of ballast water (over 65 million tonnes per annum, 59 million of which are from overseas) in numerous Australian ports.

Providing solutions to this problem is not simple. To begin with, a ballast tank is not

FRANÇOIS JOURDAN / AUSCAPE INTERNATIONAL

Ships are encouraged to reballast at sea.

ANH

just a large area inside the ship that is filled with water in lieu of cargo. It is a complex structure with numerous compartments and supporting struts that give the ship its structural strength. This means it is virtually impossible to completely empty a ballast tank of its water and accumulated sediment (where many of the unwanted organisms occur). This can only be done (with difficulty) when the ship is in dry dock.

Initially it was suggested that ships exchange their ballast water in mid ocean, thus swapping coastal organisms for oceanic organisms, which are unlikely to survive when they are discharged into our ports. However, this can only be done on board small ships in calm weather; larger ships would break their 'backs'. Furthermore, studies have shown that the ballast water must be flushed more than three times before exchange is 100 per cent, and even then accumulated sediments may remain in the tank.

Another possible solution involves chemical treatment on board. But this is becoming an increasingly unlikely option because of the cost, the problem of disposing of the chemically treated water, and also the fact that toxic dinoflagellates have the ability to produce a resting spore stage that is extremely resistant to chemicals. Another possibility is to filter the water as it is taken on board. But again there are problems. Because the organisms are very small, the filters would have to be very fine and thus would easily clog. This in turn would mean that the uptake of ballast water could be delayed by many hours or even days, making it an extremely costly exercise – one that the shipping companies are unlikely to comply with.

The main considerations for any solution are that it must be effective and cheap – in terms of time and money. If Australia was to impose costly measures, overseas countries would buy their raw material and primary produce from elsewhere.

In an attempt to reduce the risks of introductions of exotic organisms into Australian waters, the Australian Quarantine and Inspection Service (AQIS) has imposed a series of voluntary guidelines on the discharge of ballast water. Ships are being encouraged to reballast at sea, where the uptake of sediment is minimised, and also not to take on ballast water during a red tide.

A Scientific Working Group on ballast water introductions and potential control mechanisms has been established. The group consists of scientists, people from the shipping industry, State fisheries, AQIS and various government departments. This multidisciplinary approach is essential, as the problem has so many facets and has major economic consequences for our aquaculture, shipping and export industries.

— Pat Hutchings
Australian Museum

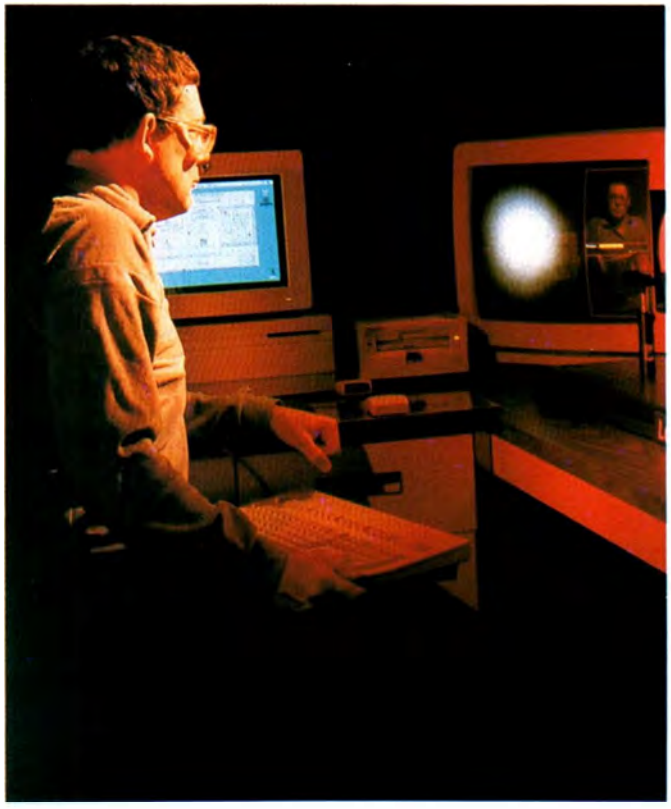
Dinosaur Gastroliths

Gastroliths may have been digestive aids in the long distant past but in the modern age they have done nothing but give palaeontologists stomachaches. New work, however, using light-scattering techniques should, at last, dispel some of the controversy surrounding these rocks from the alimentary canals of dinosaurs.

It is thought these rocks were swallowed by dinosaurs to help grind up food in their gizzards in the same way that some birds today swallow smaller stones. As a result of the mechanical and chemical processes of dinosaur digestion, gastroliths are usually highly polished and round. Unfortunately other rocks, particularly those tumbled in rivers, can have a similar appearance. So when is a gastrolith a gastrolith?

Identifying gastroliths up until recently has relied on some rather arbitrary and controversial criteria. For example, geologists demand that a gastrolith must be found with the bones of a dinosaur. Because many bones do not actually fossilise and because those that do can be scattered, a lot of potential gastroliths may have been disregarded over the years.

Roger Johnston, Kim Manley and Cheryl Lemanski of the Los Alamos National Laboratory in New Mexico have developed a practical, effective, non-destructive technique using light scattering that takes the 'hit-or-miss' subjectivity out of gastrolith identification.



COURTESY ROGER JOHNSTON

When is a gastrolith or gizzard stone just a rock? Roger Johnston analyses a sample.

Laser light shone onto a surface will be reflected at a certain angle and intensity according to the relief characteristics of the surface (such as the depth of its pits, and the angles of the walls of the pits). The rougher the surface, the more scattered the light. Johnston and his colleagues found that gastroliths tend to be much smoother (that is, reflect the light with less scattering) compared to river rocks, due to the time they spent in the gizzard (the smoothness being measured is somewhere between smoothness on a molecular level and smoothness of your kitchen table!).

The method provides the opportunity to review the status of many suspected gastroliths. If they can be identified as gastroliths, the number of genuine specimens available for research could rise dramatically providing a vast new range of opportunities to better understand dinosaur digestion, population and migration.

— K.McG.

Carrie Arkinstall (education officer at the Australian Museum), Dr Suzanne Hand (biologist at the University of NSW) and Karen McGhee (freelance science writer living in Newcastle) are regular contributors to QQC.

Taking the Bit between the Teeth

Markings left by bits on horses' teeth suggest that the invention of the wheel wasn't the first major development in human land transport...horseback riding was.

The advent of horseback riding represents a landmark in human cultural evolution. It almost tripled the distances and pace of daily travel, revolutionising all aspects of life at the time from trade to combat. Until now, however, it has been uncertain exactly when this important event first took place.

Archaeological evidence has been available for some time to suggest that horseback riding originated between 4000 BC and 3500 BC in the Ukraine. This evidence includes antler tines shaped like cheek-pieces from early bridles, discovered in Copper Age culture sites in the Ukrainian steppes, north of the Black Sea. None of the evidence, however, has been conclusive. Until recently, that is.

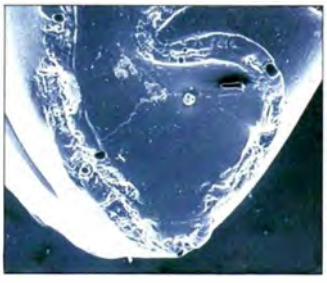
David Anthony and Dorcas Brown, from Hartwick College in Oneonta, New York, believed that the necessary proof could be found on horses' teeth. Bits are only used for riding or driving, providing a mechanism for controlling the animal's pace and direction of movement. Bit wear on horses' teeth therefore offers an avenue for identifying the use of horses as transport. Since wheels were not invented before 3300 BC, a bitted horse earlier than that could only have been a mount.

Although a bit is intended to remain on the soft tissue in the horse's mouth, horses can and do lift the bit off these sensitive areas onto their teeth, particularly their premolars. The huge strength of the horse's mandibular muscles grinds the bit on the teeth causing wear marks.

Anthony and Brown compared the premolars from modern-day domestic bitted horses with those from modern-day feral horses that had never worn bits. Using the scanning electron microscope they identified and clarified the wear as distinguishable from other tooth wear. They then set about looking for these marks on teeth unearthed at archaeological sites in Iran and the Ukraine. They concluded that horseback riding did, in fact, originate in the Ukraine in about 4000 BC, several centuries before the advent of the wheel.

—K.McG.

Tell-tale marks left on teeth by a bridle's bit provide clues to the origin of horseback riding. Top: the wear on this 4,000-year-old premolar from the Ukraine is very similar to that of modern bitted horses.



COURTESY DAVID ANTHONY

JEAN-PAUL FERRERO / AUSCAPE INTERNATIONAL

Middens or Nests?

A small furore has erupted in archaeological circles with claims that the large and spectacular shell mounds that dot the northern Australian coastline were built not by humans but by birds. For decades, it has been widely believed that they are middens of Aboriginal origin – huge waste dumps built up over centuries by generations of Aborigines on a shellfish diet.

Questions about the origins of the mounds have been raised most recently by Tim Stone, a postgraduate student in the Geography Department of the Australian National University. Stone argues that the mounds have been scraped and raked together by generations of Orange-footed Scrubfowl (*Megapodius reinwardt*). He claims the coastal mounds bear a "striking resemblance" to the large shell and earth nests of the Northern Territory, which ecologists describe as scrubfowl incubation nests. According to Stone, the coastal mounds have long been abandoned by the scrubfowl, and the organic matter they would have contained to provide the heat for egg incubation has decayed.

Stone says the Aboriginal origin theory for the mounds has grown in spite of claims by Aboriginal people, both historically and today, that birds are responsible for the mounds. Prehistorians have been too eager, he argues, for Australia to have its own archaeological monuments.

Although some of the mounds contain Aboriginal artefacts, Stone suggests these have been raked in by scrubfowl or could have been left by Aborigines camping on the mounds. In fact, Stone goes on to argue that archaeological interpretation in Australia should pay more attention to interference by birds at prehistoric sites. The removal and relocation of artefacts by birds may have skewed the archaeological record in more than one instance.

Stone's theory has many critics within the archaeological establishment. Among them are Cambridge University archaeologist Geoff Bailey, who has examined more than 300 of the Weipa mounds, and Roger Cribb, a prehistorian attached to the Alice Springs

JOHN CARNEMOLLA / AUSTRALIAN PICTURE LIBRARY

Large shell mounds in the Weipa area of Cape York.

Central Land Council.

Bailey asserts that: "Only someone who had not visited the area or who knew nothing about archaeological field observation would be fooled into confusing [middens and scrubfowl nests]". Cribb, however, admits that it is possible to "confuse" the two. He describes four types of mounds from the Cape York area: middens, oven mounds, shell mounds and 'mounded middens' (which appear to be either scrub hen mounds incorporating archaeological material or archaeological features reworked by scrub hens). However, Stone argues that these are not different types of mound, just one type of mound with different kinds of sediment.

Despite the criticisms from the archaeological fraternity, Stone's theory has received support from biogeographers and geomorphologists. The natural habitat of the Orange-footed Scrubfowl is monsoon vine forest, and the distribution of the mounds that Stone claims to be discarded nests ties in with evidence of past distributions of this kind of forest.

Further work in progress by Stone has shown that shells from all levels of one particular mound are the same radiocarbon age, which means they did not accumulate gradually as would be expected if they were deposited by generations of Aborigines. Stone now believes the mounds are deposits of coarse shell gravel left by the sea as the shoreline built out over the past 2,000 years, and that their conical shapes can only be explained in terms of subsequent scrubfowl activity. Stone's latest findings are yet to be published. When they are, though, it will be very interesting to hear how his critics respond.

—K.McG.

GEOFF AVERN / AUSTRALIAN MUSEUM

Why does the abdomen of this jumping spider mimic the head of a fly?

The Spider and the Fly

Everybody knows about the relationship between the spider and the fly: the spider builds the web and entangles the fly. However, a species of spider recently discovered in Tasmania somewhat blurs this clear-cut relationship. The spider belongs to the genus *Maratus* in the family Salticidae. Salticids are active hunters, commonly referred to as jumping spiders. They move about in short dashes and swift leaps, and will stalk and pounce on their prey. The salticids are known for their distinctive colouration and often brilliant iridescent markings.

The most striking aspect of this curious salticid is that the abdomen appears to mimic the head of a fly. Two bulbous projections look like the eyes of the fly, the spinnerets are elongated and resemble the mouthparts of the fly, and the iridescent colouring is similar to that of a fly's exoskeleton. In contrast the front half (cephalothorax) of the spider is drab-coloured.

Males in some of the other *Maratus* species have moveable lateral flaps on the abdomen that wrap around under the body. These can be extended and are used during courtship. The eye-like projections in the fly-mimicking *Maratus* may parallel the evolution of these lateral flaps.

There could be several reasons why this spider has evolved an abdomen that resembles a fly's head. The spider was caught in a pitfall trap in dry sclerophyll forest in north-eastern Tasmania. The undergrowth there is very open with a scattered covering of bracken. A spider that inhabits such open areas may be subject to high rates of predation from birds and lizards. These predators may find it harder to catch a fast-flying insect, such as a fly, in comparison with a terrestrial spider. Thus, if this species is able to fool its predators into thinking it is a fly, it may be less likely to be attacked.

Another possible reason the spider may be mimicking a fly is to fool other flies into thinking it is one too. This may allow it to approach closer to flies than would otherwise be the case. It might then have a better chance of pouncing on the fly and making a meal of it. Mike Gray of the Australian Museum has suggested that male flies might even mistake the spider for a female fly. A male fly usually approaches the front end of a prospective mate and then goes to the rear of the female to mount. At this point the masquerading spider could make a meal of its amorous suitor.

On a lighter note Mike Gray came up with a further hypothesis. As both specimens obtained were males, it may be that females do not possess the fly's head. Other species of spiders are known where the male offers food to the female in order to distract her while he mates. Maybe the fly-like abdomen in the male could be used as a food offering to the female to allow him to mate.

There are many examples within the salticids of insect mimicry. Species of the tropical genus *Diolenius* are also known to mimic flies. Ant mimicry has been recorded in the genus *Myrmarachne*. In these species the abdomen has evolved a constricted area that simulates an ant's waist and gives the spider an ant-like appearance. The anterior pair of legs is slender and frequently raised and waved like antennae. The disguised spider can then join an ant-trail and hunt down its prey. Ant mimicry may also be an effective defence against predatory birds. The birds avoid the ants because of their objectional taste and, by associating shape with taste, may also avoid the ant-like spiders.

There are obviously lots of ideas as to why jumping spiders are such prolific mimics. What is needed is a few avid spider-watchers to test the validity of these ideas.

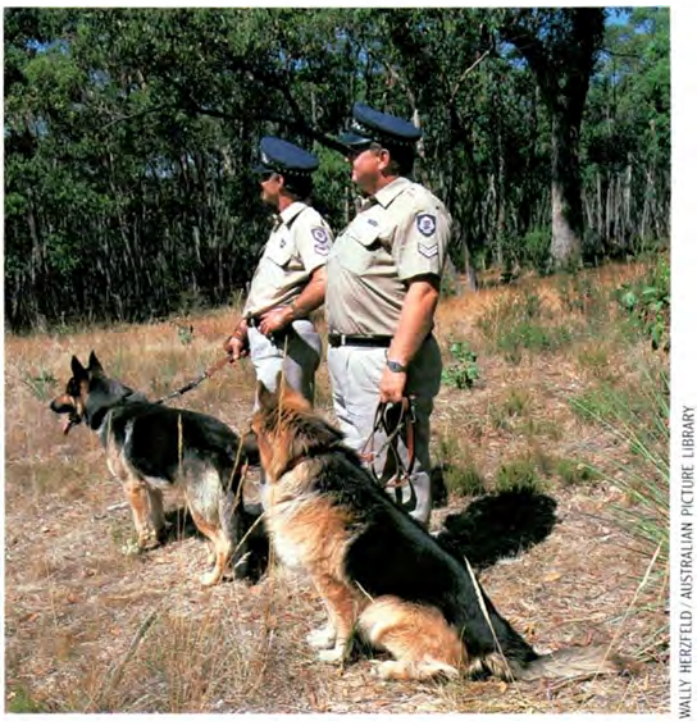
—Robert Taylor & Liz Turner
Tasmanian Forestry Commission
Tasmanian Museum

Dog Scents Nonsense

The scales of justice have sometimes tipped under the weight of evidence based on the presumed infallibility of the canine sense of smell. But a recent study from the US questions the traditional views of the olfactory capabilities of 'man's best friend'.

Lehr Brisbin, from the Savannah River Ecology Laboratory in South Carolina, and Steven Austad, from Harvard University, set out to test whether dogs could discern their trainer's smell from that of other humans, regardless of the body parts from which the

It has long been presumed that the sniffer dog's sense of smell is infallible. New research indicates otherwise.



WALLY HERZFELD / AUSTRALIAN PICTURE LIBRARY

scents had been collected. Using standard training procedures, they taught three dogs (a labrador, an American Staffordshire terrier and a bloodhound) to recognise the scent of their trainer's palm to retrieve an item with that smell, and ignore items with any other scents. They found the animals had little difficulty distinguishing objects with the smell of their trainer's palm from objects with no human scent or objects that had been handled by a stranger. The dogs also readily distinguished objects with the scent of their trainer's elbow from objects with no scent. But when confronted with the scent of their trainer's elbow and the scent of a stranger's hand the dogs came unstuck. In this test, statistically, the dogs' selections could be shown to be little more than random.

Brisbin and Austad suggested two possible explanations for this: either humans do not have an individual characteristic scent recognisable by dogs, in which case the use of dogs to match presumed criminals with physical evidence would be invalidated; or humans do have individual odours recognisable by dogs but these are clouded by the distinctive scents of the different body parts. The latter would explain why the dogs in the experiment became confused when presented with odours from other parts of the body.

If the latter theory proves to be correct, training regimes clearly need to be altered so that dogs, particularly those used in law enforcement, are trained to recognise the scents of individuals regardless of which body parts the scents come from.

—K.McG.

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QUICK QUIZ

1. **Who was the author of the bestseller *A brief history of time*?**
2. **What is Lapita?**
3. **Reproductively, what makes seahorses so unusual?**
4. **What is the name of the largest proven meteorite crater in Australia?**
5. **In which country was the 1992 Earth Summit held?**
6. **In what year did Lake Torrens (South Australia) last fill with water?**
7. **What does AIMS stand for?**
8. **How many legs does an adult tick have?**
9. **Who, in the late 1970s, proposed that the whole Earth be considered as a single, self-serving superorganism, called Gaia?**
10. **In whose navel would you expect to find more fluff: Italian opera singer Luciano Pavarotti or Singapore's first Prime Minister Lee Kuan Yew?**

Answers in the Questions & Answers Section

We might well envy a cicada's life, which ends in a six-week blaze of flying, singing and procreation.

DECEMBER DECIBELS

BY STEVE VAN DYCK

OTHER COUNTRIES MAY HAVE snowmen, yule logs and roasting chestnuts to remind them that it is Christmas, but here in Australia we can boast a heavenly choir capable of pounding out more December decibels than all the sleigh bells of the north put together. Our cicadas are now up and carolling, and there is no way anyone can turn a deaf ear to their Christmas chorus. Even alone, a Double Drummer at close range can pump out 120 decibels, which puts it up near the pain threshold along with ads for used cars and carpets. And by the time a male in full voice has drummed up the support of 50 or 60 other tenors, it's time to look for a new spot to boil the billy.

This type of passive eviction is exactly what some species of cicadas are counting on. You see, these magical insects hatch on the horns of a dilemma. With only two to six weeks to indulge in all the pleasures of reasonable parenthood, they have to not only sing hard to attract mates quickly, but at the same time avoid being seen and eaten by predators. By massing together and making such a quadraphonic din, those birds that would dearly love to dine on cicada-rear-end are driven away by the shear aural agony generated by the all-male hummers.

It's just as well our priorities change with the passage of years otherwise I'd still be knee-deep in cicadas. In my day every red-blooded ten-year-old spent every afternoon and every weekend of summer catching cicadas, and our long-handed nets, gauze-covered carrying cages and bare feet marked us as professionals and separated us from the sissies who wore hats or boots.

A cicada hunt had all the elements of the real thing for young 20th-century Nimrods ever since giant tree sloths could no longer be ambushed in peat bogs on the way home from school. Cicadas were every bit as tricky and calculating, requiring stealth and slyness from the hunter. Even their detection required Cro-Magnon cunning because, like a good ventriloquist, a cicada's voice and its body always seem to be in different trees.

The hunt also developed leathery, or at the least well-scabbed, knees, heads, shins and elbows. This horny covering protected more delicate tissues when a rough ride down a banksia trunk got out of control, or when there was no time to organise a fall during a miscalculated leap for a hard-to-get specimen.

If you were by yourself you could dare to wear a hat, but only if you knew there was no chance of bumping into any mates. It was a help in countering a nasty trick cicadas had of flying off together in a vapour trail that left you thinking the monsoon cloudbanks had burst. Being young

Cherrynose cicada.

PHOTOS: DENSEY CLYNE

and vile (and male) we always ascribed this sap-sucker's bespattering proclivity to females, which were called by the foul but universally accepted name of 'piss-whackers'. We were wrong of course . . . feeding cicadas (both sexes) suck so much for so little return and have to relieve themselves so often that their behaviour might be far more appropriately likened to that of the average drinking *male* of a higher order! But coming home well-marinated and red-eyed to a bedroom of dying and drying cicadas was all part of the chase. Even a Neanderthal could be excused for coming through the door smelling a little musky after a good hard yak hunt.

Like the music to "Blue Hills", the names of those cicadas we chased can still bring a nostalgic tear to my eye. Greengrocers and Yellow Mondays (pronounced 'Yella-Mundies') were really just colour variants of the same species *Cyclochila australasiae*; Cherrynoses or Whiskey-drinkers (*Macrotristria angularis*) were prized and beautiful but some years you'd never see any; Razor Grinders (*Henicopsaltria eydouxii*) would send waves of evening chorus blowing around the hot valleys; Double Drummers (*Thopha saccata*), the Schwartzeneggers of cicadas, were big on noise and big on bodies but unbearable to be around for long; Bladders or Gas Bags (*Cystosoma saundersii*) were slow, easy to catch green blimps; and Black Princes (*Psaltoda plaga*) . . . the cat's pyjamas of cicadas. It was common knowledge that any chemist worth his aspirin would pay through the nose for the chance to get his pestle on a pair of a Black Prince's wings. The said price was between ten pounds and ten shillings depending on who was spinning or swallowing the yarn. And who would press the question as to what the chemist did with them for that price?

Many people look on the cicada's strange existence as a Romeo and Juliet affair, where youth and beauty are ravaged by a devastatingly short life expectancy. But a deeper look well below the trees reveals that, far from having a premature swan song, some cicadas rank with the longest living of insects.

Soon after mating, female cicadas slash little pockets along a branch and lay a small number of Rice-a-Riso eggs in each pocket. After hatching, the tiny nymphs fall and bury themselves about 30–40 centimetres below the soil's surface for anything from 1–17 years depending on the species. In its cool subterranean cellar, the growing nymph relaxes and sips on the rich liquor of sugary juices it has tapped from surrounding tree and grass roots.

So instead of pitying the cicada, many might even envy the prospect of a long life such as theirs, installed in a cool dark distillery with a firm promise that the end would come in a six week blaze of heavenly light, singing, flying like angels, and procreating until their tymbals fall off.

As a child, so completely consumed was I with cicada worship that if, on my tenth birthday I'd been granted one wish, it would have been for a swarming cloud of cicadas consisting of all of the 200-odd Australian species to land in my net. Now that I'm much older and wiser and more aware of what's waiting in the wings, all I can pin my hopes on is reincarnation cicada-style. But knowing my luck I'll see my rear half go down a currawong's throat just as I'm about to spread my wings. ■

The shrill of the Greengrocer is a common sound around Christmas time.

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Steve Van Dyck is in charge of the Mammal Section of the Queensland Museum where he has worked since 1975.

Their continued existence in Australia was unknown to scientists until they were rediscovered in 1948.

BANTENG

BY DAVID BOWMAN

KATHIE ATKINSON

WHAT DO YOU DO WHEN YOU are harbouring a large and stable population of an exotic animal that is vulnerable to extinction in its native homeland? This is the type of conservation conundrum that South-East Asia's Banteng (or Bali Cattle) poses for Australia.

Banteng *(Bos javanicus)* are smaller and more gracile than the more familiar beef cattle and Water Buffalo, with distinct white rump patches and short white 'socks' above their hooves. A single introduction of 20 Banteng was made in 1849 at Victoria Settlement on Cobourg Peninsula. The herd was imported from the island of Bali in Indonesia (hence the common name 'Bali Cattle') but ran feral following the evacuation of Victoria Settlement later that same year.

Banteng remain one of the more esoteric additions to the Australian fauna. In contrast to feral buffalo, which quickly colonised the coastal regions of the Top End (see ANH Winter 1992), Banteng remained so isolated on Cobourg Peninsula that their continued existence in Australia was unknown to scientists until they were rediscovered in 1948. Cobourg Peninsula is a declared national park (called Gurig National Park), which is jointly managed by the traditional Aboriginal owners of the Peninsula and the Conservation Commission of the Northern Territory. Banteng are locally abundant in the park with recent aerial surveys indicating a population of about 1,000 to 3,500 animals.

The threat of the Banteng's extinction in Asia raises complex issues for Australian herds.

Why Banteng never spread poses an intriguing biogeographic question. One plausible hypothesis is that the specific habitat requirements of these ungulates could not be met in environments beyond the Peninsula. Banteng naturally occur in a mosaic of savanna and rainforest habitats, retreating to the shady forests during the heat of the day. They require fresh drinking water every day but are also known to occasionally drink seawater in order to acquire minerals. It is therefore possible that the extremely infertile soils that support eucalypt savanna may cause mineral deficiencies in Banteng, hence explaining the close proximity of the animals to the coast.

The isolated herd of Banteng on Cobourg is becoming internationally significant because of their shrinking distribution throughout South-East Asia. Threats to Banteng in their native habitat include poaching, competition with feral stock, and both legal and illegal habitat destruction for intensive agriculture and forestry. Only a few herds are currently protected in national parks, and even in these reserves the future of wild Banteng is far from secure. Given this situation the IUCN has listed the species as vulnerable to extinction throughout its range. The threat of extinction of wild Banteng in South-East Asia raises some complex issues concerning the future of the Australian herds, which represent the largest and most secure untamed population of the species in the world.

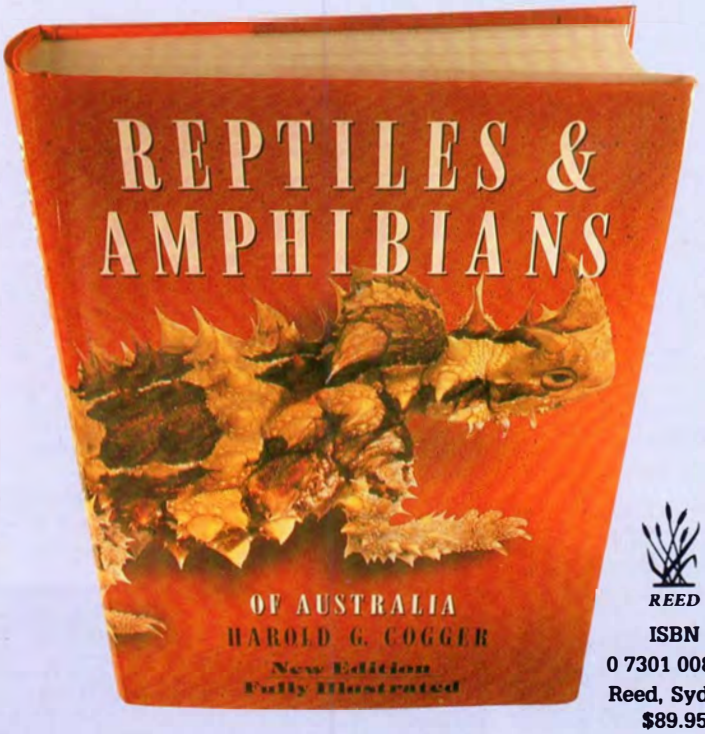
The Cobourg herd provides an extraordinary opportunity to study the behaviour and ecology of a rare bovine in the wild. Big game hunters from all over the world pay substantial safari fees to hunt Banteng on Cobourg Peninsula. The safari hunting is regulated by the Gurig National Park. Presently 80 cows and 30 bulls are permitted to be shot by hunters within the park over a five-year period. Aborigines currently receive about $2,500 for each trophy-sized bull and $400 for each cow shot.

Research into population numbers and impacts of exotic species in Gurig National Park has shown that the most conspicuous impact of Banteng is the reduction of grass biomass in savannas (which may have the beneficial effect of reducing wildfire intensity). But they also trample burrows of some native rodents, create a browse line on trees, and create tracks through monsoon forests. Obviously these impacts increase with greater densities of animals. The relative impacts of different stocking levels of Banteng on both the native flora and fauna remain an important, and as yet unresolved, question.

The Banteng poses a complex conservation conundrum: a feral animal whose wild relatives are endangered, existing in a national park at the request of the Aboriginal owners of the land. Further, the animal is of cultural and historic interest being a living reminder of an early period of European colonisation of northern Australia. Obviously, exotic animals should not be introduced into areas dedicated to nature conservation, but the presence of the Banteng in Gurig National Park appears to be a special case. It is highly desirable to keep some large representative areas of the park free of Banteng and this can be readily achieved by the construction of fences across the narrow peninsula. A fence at the neck of the peninsula has been built to stop Banteng moving out of Gurig National Park.

As environmental changes continue to threaten global megafaunal biodiversity, the question of some parts of Australia functioning as a Noah's Ark may increasingly confront the 'lucky country'. ■

Dr David Bowman is a wildlife research officer with the Conservation Commission of the Northern Territory. Over the last eight years he has undertaken biogeographic studies of both animal and plant distributions throughout northern Australia. His research into Banteng has been funded by the ANPWS endangered species unit.



REED
ISBN
0 7301 0088 X,
Reed, Sydney.
$89.95

Author Dr Harold Cogger, Deputy Director of the Australian Museum interviewed by Michelle Burns from Reed.

Dr Harold Cogger says "the aim of my book is to provide a means of identification; what reptiles we have in Australia and how to identify them as easily as possible". Now in its fifth edition, Dr Cogger says "the book is a great pleasure to me. I originally wrote it because there was nothing around that was a means of good identification. This is the book that I wished I'd had".

Reptiles and Amphibians of Australia now has 776 pages. I asked Dr Cogger if there was an interest in a 2 or 3 volume set? "The real advantage of maintaining an identification manual in one volume is because there is no other way, with roughly 1000 species, that you can easily identify. I have, as others have, used this book as a field guide and a manual at home. The text is an essential part of the book and the specialist has the keys and line drawings, and the layperson the colour photographs for identification.

Dr Cogger agrees that frogs are wonderful. One of his favourites is the Southern Gastric Brooding *(Rheobatrachus silus).* The eggs hatch in her stomach and the young jump out of her mouth. "Australia has the only animal in the world that broods the young in her stomach".

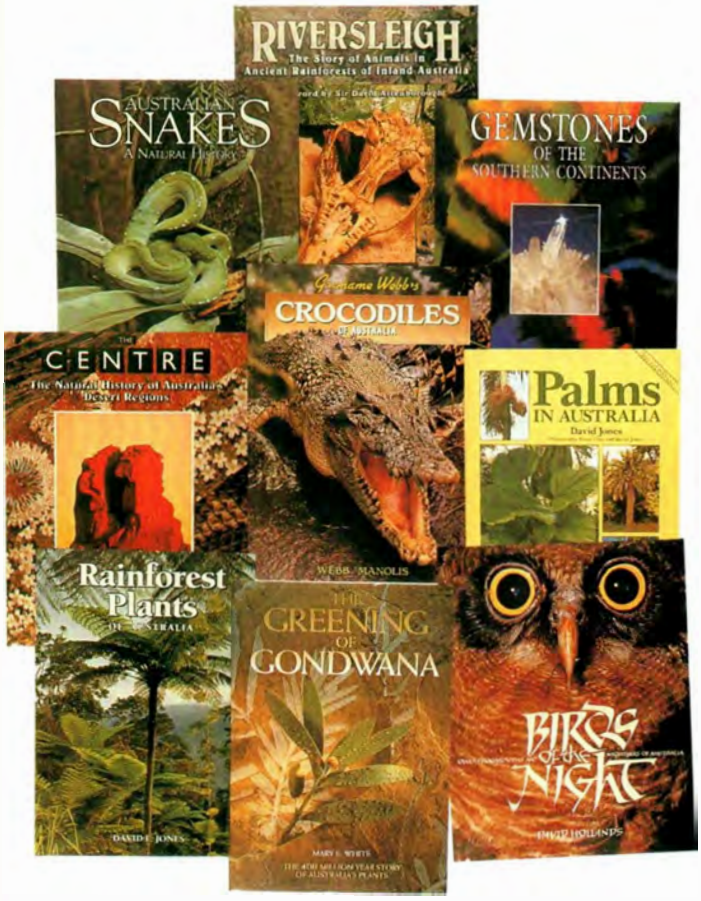
This edition was a combined effort between the author and his wife Heather, he drew from slides and Heather inked them in, "with close to 1000 drawings and an average of two hours each, we've spent a total of one years full time work on the drawings".

Since the first edition an extra 50% of species have been added. Is it because of new breeding patterns or cross breeding? "There are two main reasons; there are more people exploring remote areas like Arnhemland and finding species never seen before. We are finding more species because when looking at something well known and do biochemical or genetic work, we discover what we thought was one species is in fact five species in different places in Australia. We do not have as many species as South America but 95% of the species in Australia are not found anywhere else in the world, except the Pacific Islands". The book has a special section on Australian island territories, Christmas Islands, Cocos (Keeling) and Norfolk Islands.

Dr Cogger says "The previous editions did not have the quality of design and layout which now places the relevant text adjacent to the photographs. The new edition is tremendous, with full colour photographs, colour maps, identification keys and line drawings. There is no comparison".

REED BUYS REED

One of Australia's leading publishers of natural history and botanical books has a new owner.



Established in New Zealand as A.H. & A.W. Reed, Publishers and Booksellers over eighty years ago and in Australia in 1958, it became Reed Books in 1983. In June 1992 the company was acquired by Reed International Books Australia Pty Ltd, its U.K. parent company being one of the world's leading publishing and information companies. The name's the same but co-incidental. Reed Publisher Bill Templeman, considers this a positive move for the company with the new Group providing a good home for the imprint.

Now trading as Reed the company will continue in its publishing tradition of natural science, natural history, botanical and pre-history subjects. The catalogue lists some 100 active backlist titles from authors who are either scholarly or good writers on their subject. International co-publishing is well established with University presses in America such as Princeton, Cornell, the Smithsonian Institution, and with leading publishers in Europe.

Reed is embarking upon an ambitious expansion programme. For this we invite submissions of publishing proposals in natural history, natural science, botanical and horticultural, and pre-history subjects. These could be works prepared and ready to go or a long term project requiring an expression of publishing interest and commitment. Such proposals would be for adult general interest, not educational text works.

Enquiries and submissions to Bill Templeman Publisher or Louise Egerton Managing Editor at Reed.

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Yam chips are superb, he says, but boiled mashed yam is dreadful.

ITALIANS AND BIRDS, KANAKAS AND YAMS

BY TIM LOW

AS 12 YEAR OLDS, BARRY LYON and I were obsessive about snakes. Every weekend we were down the local creek flipping over sheets of iron and other junk after keelbacks and whip snakes. After graduation Barry became a national parks ranger in northern Queensland, catching crocodiles and turtles for research. He now lives with his family in a farmhouse south of Ingham, where he runs wildlife tours and writes magazine articles.

Nowadays, Barry, like myself, has become obsessed with wild foods. He spends his spare time nibbling strange fruits and digging up yams. Most significantly, by talking to local people, he is uncovering a fascinating wild foods culture in the sugar belt of northern Queensland.

Some Thursday Islanders came and filled the back of the ute with yams—some of them wouldn't fit into potato bags.

Bamberoo, his local township, is populated by Italian sugar cane farmers, the descendants of farm labourers who migrated to Australia after the Kanaka trade ended. Times were tough for the first generation, and wild birds were an important food.

When I visited Barry last summer he took me to meet his Italian cane-farming neighbours, John and Toni Truffa, aged 35 and 34. They reminisced about eating such birds as Rainbow Lorikeets, Wompoo Fruit-doves, Brown Cuckoo-doves, Torresian Imperial-pigeons, cockatoos, "storm birds" (Channel-billed Cuckoos), quail, duck, Australian Brush-turkeys and Magpie Geese.

Even flocks of "bullfinches" (Chestnut-breasted Mannikins) were shot for the table, although it was tedious plucking the tiny birds. These were fried and eaten whole, bones and all. Toni remembers her father making a trap to catch Peaceful Doves. She used to sit on the window sill to pull the string, and when enough were caught a meal was made. John still shoots occasional Brush-turkeys. He remembers eating Pandanus seeds *(Pandanus spiralis)* and Cluster Figs *(Ficus racemosa)*, but no other wild plants.

Barry has developed a special interest in the tucker of another local culture—the Kanakas. Brought in last century from Vanuatu, Tonga and other Melanesian islands, the Kanakas were forced to work the cane fields under slave-like conditions. After their terms of labour ended, many chose to stay in Australia, and northern Queensland now has a vibrant Kanaka community.

A few years ago Barry befriended an elderly Kanaka, Smiler Backo, who introduced him to the local yam culture. Kanakas are very fond of Taro *(Colocasia esculenta)* and the Asiatic Yam *(Dioscorea alata*, see ANH Autumn 1989). Smiler died a couple of years ago, but Barry was able to tell me much of what he'd learnt:

"Old Smiler planted out patches of yams years and years ago. I don't think they had enough land of their own so they'd plant out yams by the river, in a wild or semi-wild situation. This assured them of a good supply. You see them now with their

Sweet, succulent Cluster Figs were eaten by Aborigines, colonists and Italian immigrants in northern Queensland.

PHOTOS: TIM LOW

sacks, after yams. Smiler said some Thursday Islanders came and filled the back of the ute with yams and some of them wouldn't fit into potato bags. They were digging them with crowbars. There are lots of good yams along the Herbert River.

"Also while I was on the hunt for yams I picked up an islander called Phillip who was hitchhiking to Cairns. He had an uncle in Babinda who, during the war, was worried the Japs were coming, and planted out yams so they were assured there'd be a food supply. He said their favourite way to cook them was to boil them in the water they'd cooked corned beef in."

Aided by Smiler, Barry learned to recognise five wild forms of Asiatic Yam, distinguished by tuber and stem colour. (In Tonga, 86 varieties are known.) He became an expert yam cook. (Yam chips are superb, he says, but boiled mashed yam is dreadful.) Barry also became interested in growing yams. Smiler gave him some seed. The yams thrived.

Barry recalled: "I had too many yams for us, so I gave some away to neighbours. The Italians like them. I had asked earlier on in shops if they sold yams, and one shop in Townsville, BJ's Fruitbowl, said they had previously sold yams grown by New Guinea people on the Atherton Tablelands. They said they'd take yams from me, at $2.50 a kilo. My biggest yams were five-and-a-half kilos. I sold $800 worth. Next year I'll be selling more. Altogether I've sold to three shops. I even sold about $150 worth of wild yams from along the Herbert River. But I never told the vege blokes where they came from."

The uniformly green colouring of this Taro growing near Barry's house indicates it is native. I tasted boiled young shoots and was stung in the mouth.

Kanakas also have a fondness for Taro, which they grow. The heavy starchy tubers are eaten boiled or baked, and the young leaves are boiled and eaten. Taro is a native plant in northern Queensland, but Australian forms, unimproved by agriculture, have very irritant tubers, caused by the sharp crystals of calcium oxalate. Before eating, these must be removed by grating and soaking.

Native Taro flourishes in a creek only 100 metres or so from Barry's house. He warned me against trying it, for this is the native variety that burns. He knows this for sure because of a story told by Smiler's daughter, Carol Manzoni. Barry said, "Her cousin and some friends were driving past the creek when they saw the taro. 'You beauty', they thought, and they pulled up. They boiled up the taro, and burnt themselves!"

Barry's anecdotes provide an unusual insight into the lifestyle of Australia's Kanaka population. In all the literature on Australian wild foods I have come across only one account of Kanakas harvesting wild plants. Mrs Lance Rawson in 1890 told of Kanakas near Maryborough eating a delicious fungus found on trees and logs, and said they boiled the shoots of Sandpiper Fig trees *(Ficus opposita)* to eat like cabbage. ■

Suggested Reading

Rawson, L., 1890. *The Queensland cookery and poultry book*. William Hopkins: Rockhampton.

Tim Low is a nature writer and environmental consultant living in Brisbane. He is the author of four books, including Wild food plants of Australia, *recently revised and reissued in paperback by Angus & Robertson.*

PROFILE

He made his programs, finished his doctorate, built a mudbrick house—all while living in a caravan.

ROCKCHOPPER: DR PETER HUNT

BY ROBYN WILLIAMS

COURTESY ABC RADIO

HE WAS HALF WAY THROUGH A PHD in geology when a friend saw the ABC Science Unit's advertisement for a broadcaster and commented "You've got a big mouth. Why not apply?". So Peter Hunt, despite his academic successes so far, did indeed write to us. Making awkward noises had always been his forté, so why not have a larger audience?

Even his PhD showed a determination to take an unconventional course. It was on polar wander paths: charting the movement of magnetic poles through traces preserved in the magnetism of rocks. It was the kind of project that was risky and difficult, but like the very best of research, likely to open whole areas of further investigation if it came off. It did.

The PhD was eventually completed in the unlikely setting of an ABC radio office. He made his programs, finished his doctorate, and built a massive mudbrick house—all at the same time—while living in a small caravan in the bush north of Sydney.

When he came to be interviewed I was astonished to meet a very young looking man. He had a small failure of a beard, and an odd hunch, which turned out to be the outward sign of congenital malformation that was to be his undoing. He was incredibly funny. We asked him about overseas travel: he'd never left New South Wales! Did he read widely? Hard to tell. Had he any creative activities that might assist in broadcasting? It turned out he helped run both a rock band, a wind quartet, and played both flute and clarinet.

We withdrew to consider our options. There was no doubt. This fellow was a 'one-off'. No commercial broadcasting organisation would dream of hiring such a brilliant 'eccentric'. But for us he was clearly a challenge, someone who would stir up the ABC and, no doubt, our listeners. We hired him.

On his first day I asked Peter Hunt to write down a page of the most arid and mind-numbing geological jargon he could muster. I did not tell him what it was for. I took the page, inserted a few verbs and gave it to John Clarke, newly arrived from New Zealand. (Clarke now writes films and appears weekly with Brian Dawe on the television programs "A Current Affair" and "Daybreak").

Clarke and I then went bush. He adopted a Scottish accent (which Dr Alex Ritchie, head of fossils at the Australian Museum, took to be a send-up of himself) and read Hunt's words while scraping at the ground as I recorded both. It became the opening of one of the first Science Show hoaxes: The Fossil Beer Can, in which we showed that modern humans, *Homo micturans*, had their origins in Australia!

With such an outrageous beginning Peter Hunt's career never looked back. He produced and presented "Technology Report", "Warmboot" (an irreverent program about computers and how to despise them), then "Earthworm", about the environment, and finally "Green and Practical".

In a 12-year spell of incredibly hard work in radio, Peter Hunt showed how one could be tenaciously journalistic while at the same time maintaining first-class scientific standards. He investigated the case of the Long-footed Potoroo in the southern forests of New South Wales and what it meant to the future of logging. He ventured into the Karri forests of Western Australia, talked to the timber workers there, and exposed the practice of wilful damage of valuable timber so that it could qualify for chipping. He exposed the same frauds elsewhere.

For these programs Peter won the McKell Award for environmental journalism and the Michael Daley Prize for science reporting. There were lots of other accolades for a true Australian original whose determination to get to the truth of the scientific matter at hand was matched only by his sweetness of temperament.

He died at 39, very suddenly. The ABC had just launched a weekly program on environment ("Green and Practical") of which he was the backbone. Everyone was shattered.

Peter Hunt's heart had been twisted in his body when he was born (Fallot's tetralogy) and had been subject to extensive surgery. Having spent years of his youth in hospital or struggling for health, it was only in adulthood that he seemed fit. But the flaw still lurked there.

On the morning of Peter's death the Federal Minister for Education, Kim Beazley, announced the 1992 Earthworm Awards program, a project for youngsters that stemmed from Peter's broadcasts. It was the first of many tributes from national figures in politics and in science: from conservation groups of course, but just as much from leaders in the corporate sector.

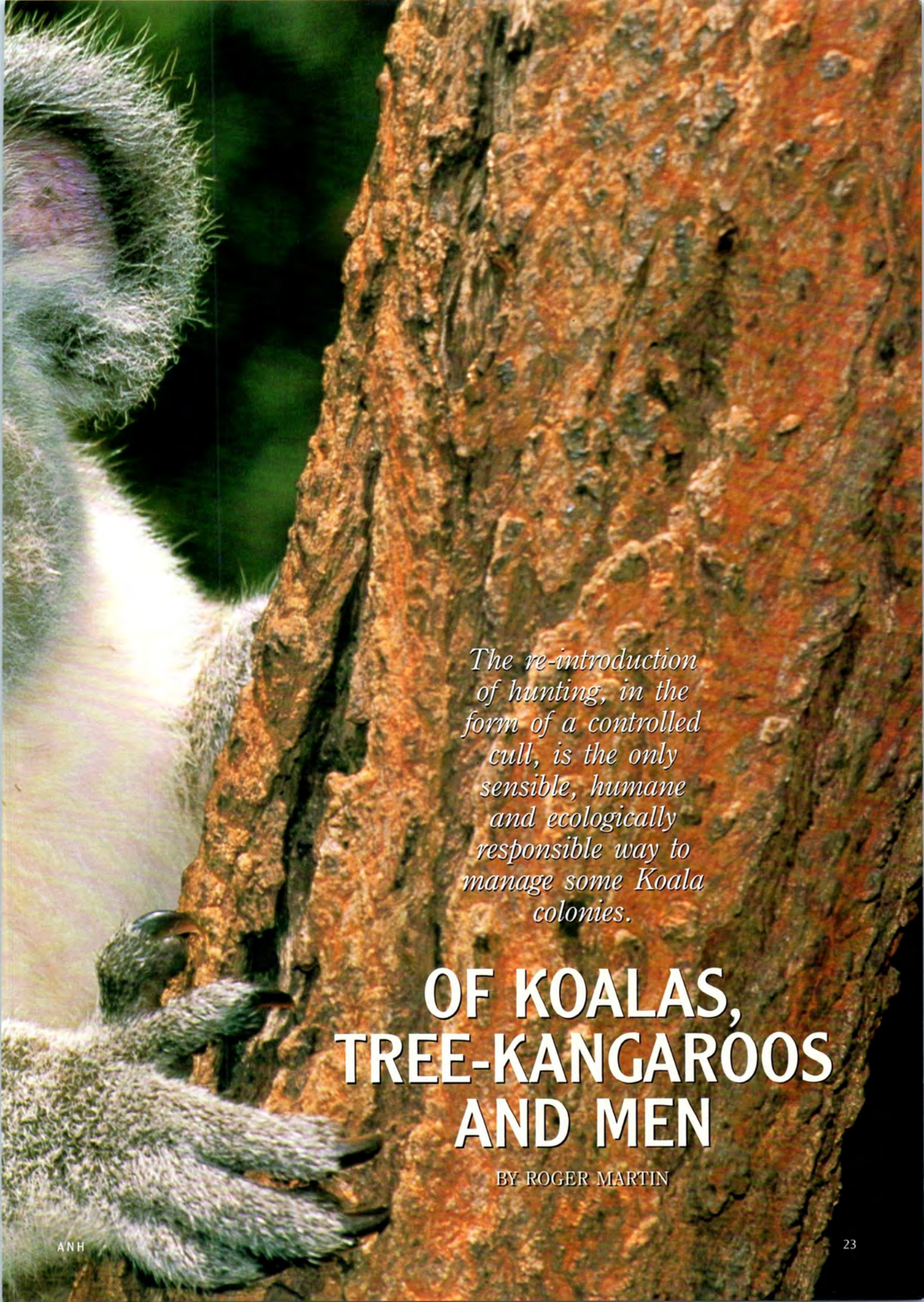
And from overseas, one of the tributes I found most telling, given the unexpected nature of Peter Hunt's arrival at the ABC, came from Anita Gordon, Executive Producer of Canada's science show "Quirks and Quarks". She had produced a sensationally successful series called "It's a Matter of Survival" with David Suzuki, inspired, it turns out, by Peter Hunt. She wrote: "It was Peter's passion for the environment and the program he was doing when we were in Australia in 1987 that first got me fired up about the future of the planet. I often quoted him later when people asked me about 'It's a Matter of Survival'. I'm only sorry that I never got to tell him that personally. But I guess that's often the way." ■

> No commercial broadcasting organisation would dream of hiring such a brilliant eccentric.

As Presenter of Radio National's Science Show, Robyn Williams has the opportunity to interview many interesting people in science.

HANS & JUDY BESTE / AUSCAPE INTERNATIONAL

A lack of predators has meant some Koala populations have not been kept in check.



The re-introduction of hunting, in the form of a controlled cull, is the only sensible, humane and ecologically responsible way to manage some Koala colonies.

OF KOALAS, TREE-KANGAROOS AND MEN

BY ROGER MARTIN

THE BASIC FACT OF KOALA'S NATURAL history, known to most school children, is they feed on eucalyptus leaves. When I began research into the ecology of the Koala *(Phascolarctos cinereus)* 15 years ago, the question I addressed was why they did not regulate their numbers in accordance with the availability of this food supply. Often populations increased to the point where they overbrowsed, defoliated and killed their major food trees. In many cases this led to food shortage, malnutrition and the death of the animals.

There have been many examples of this in Victoria, the most famous on Quail Island in 1944. Artificially established in the early 1930s, this population increased exponentially until most of the food trees on the island had been stripped bare. Then the Koalas began to die. Once the general public became aware of this, there was a substantial outcry that eventually resulted in government wildlife authorities relocating all the surviving Koalas to the mainland. This marked the start of a translocation program that became the standard method of managing overpopulation in Victorian Koala colonies.

Mammal populations often exhibit cyclical changes in abundance with eruptions followed by abrupt crashes. Most predictably this happens when individuals are unable to move to other areas, such as may occur in artificial enclosures or on small islands. Quail Island seemed to be a typical case. However the phenomenon had also been reported for mainland Koala populations, as on Wilson's Promontory in

Why don't koalas regulate their numbers in accordance with their food supply?

1915. In 1977 I began monitoring a population at Walkerville in South Gippsland. This was an endemic (naturally occurring) population in a large area of woodland with many avenues of dispersal available to it. When I began the study many of the large Swamp Gums *(Eucalyptus ovata)*, the major Koala food trees in the area, were being overbrowsed. During the next four years the number of Koalas increased, as did the scale of defoliation, until most of these trees were killed. The condition of the animals then deteriorated; many died and some, particularly the young, emigrated. Over the final few months of the study the population declined from over 40 individuals to just six.

One of the tenets of textbook ecology is that animal populations evolve, through natural selection, to a point of self-regulation. In this way overpopulation and overexploitation of resources are avoided. In mammal populations this is usually achieved through competition, either with members of the same species (intraspecific) or other species (interspecific). The maintenance and defence of an exclusive territory would be an example of intraspecific competition, and the impact of predators and parasites of interspecific competition. Koalas, however, are not territorial and the Walkerville study provided no evidence of any other regulating mechanisms. Significantly, this population, in common with most other

On Quail Island an artificially established Koala colony grew until the food trees were stripped bare, resulting in wide-scale Koala deaths.

FORD KRISTO

Koala populations in Australia, had no predators. In Victoria the assumed predators of the Koala—Aborigines and Dingoes—had been eliminated shortly after European settlement. It has been argued, in an article written by Harry Parris in 1948, that Aborigines were the more significant of the two. Parris' forbears settled on the Goulburn River in the 1870s and, relying on their recollections and other published accounts of early settlers, he reconstructed the changes in Koala abundance in the area from the time of white settlement. He found Koalas were not mentioned in any accounts prior to 1850, occasionally sighted in the early 1850s, abundant by the late 1860s and in the thousands in some areas between 1870 and 1890. He observed that this increase coincided with the annihilation of the resident Aboriginal population and suggested that it was their hunting that kept Koala numbers low.

Despite his failure to consider the role of other influences, such as Dingo predation and bushfires, I found Parris' argument most appealing. There is no doubt that Aborigines were significant predators of Koalas—numerous references in the contemporary literature attest to this. There is also no doubt that the decline of the Victorian Aborigines began around 1840. Intuitively, however, I found it difficult to accept that hunting by humans was a significant force in regulating the abundance of a large mammal species. The reviewers of my thesis had trouble believing it too! To quote one: "although it does present a plausible story, [the treatment of] historical population changes is speculative and unsatisfying because of the poor data base available".

In the late 1980s I began a study of one of Australia's least-known marsupials, Bennett's Tree-kangaroo *(Dendrolagus bennettianus)*. This species is found only

An Aboriginal hunter heavily laden with animals, circa 1915: hunting of Koalas and tree-kangaroos in the past helped keep populations stable.

AUSTRALIAN MUSEUM ARCHIVES

FRITZ PRENZEL / AUSTRALIAN PICTURE LIBRARY

Goodfellow's Tree-kangaroo from Papua New Guinea.

in northern Queensland in the rainforests north of the Daintree River. Its habitat was coming under increasing pressure from new roads and associated tourist developments. My brief, from the World Wide Fund for Nature, was to accumulate basic ecological information on Bennett's Tree-kangaroo so that its conservation status could be assessed. At that time the question of human predation and its impact on tree-kangaroos wasn't a priority. However, I was aware of recent work in the area by an anthropologist who suggested that the local Aboriginal people still used some traditional foods. It occurred to me that this could include game species and I might be able to get some idea of hunting intensity and its impact on tree-kangaroos: the sort of first-hand information I was never able to obtain for Koalas.

It didn't quite work out that way. The combined effects of alienation from their traditional lands, close settlement and alcohol have devastated traditional Aboriginal society on Cape York. I only spoke to one old man who had hunted tree-kangaroos. However, from piecing together what he told me with fragments of oral and published information, a fascinating picture that was in many ways complementary to Parris' story emerged.

BENNETT'S TREE-KANGAROO, THE *TCHA-ribeena* of the Kuku-Nyungkul people, was a prestigious game species in the Bloomfield River District. Dudley Le Souef, an early director of the Melbourne Zoo, relied on the hunting prowess of these people when he made collecting trips to the area in 1894 and 1897. On his first trip he collected 12 tree-kangaroos, most of which were found in the difficult terrain near the top of the range above the Bloomfield River. Le Souef was told by the Aborigines that tree-kangaroos were more plentiful further south, on

There is no doubt that Aborigines were significant predators of Koalas—numerous references attest to this.

JIM FRAZIER

A six-month-old Koala being weighed. A low birth rate is the only factor retarding population growth in some areas.

P. GERMAN

Mount Peter Botte, and he went there with them on his second trip in 1897. The hunters collected several tree-kangaroos on the mountain but, to Le Souef's frustration, they would not go with him to the summit. In their mythology the twin monoliths at the summit were the sisters *Barbar* and *Ginpure*. All of the upper slopes were a taboo area for them.

My study site was further north at Shipton's Flat, an area of lowland rainforest at the base of Mount Finnigan. The Aborigines had permanent camps here until they were moved to the Bloomfield River Mission in the 1950s. From my conversations with the old Aboriginal man, who had lived around Shipton's Flat, I learned that he and his tribesman had once hunted tree-kangaroos throughout these lowland forests. Dogs were used to find the animals and they were usually shot out of the tree tops. However, the hunters never visited the upper slopes of Mount Finnigan as this too was a 'story place' where they were afraid to go. Other elements of the story came from a local white family, remarkable naturalists who

The hunters never visited the upper slopes of Mount Finnigan as this was a 'story place' where they were afraid to go.

have been mining tin and running cattle at the base of Mount Finnigan for several generations. They told me that until 20 years ago the upper slopes of the mountain were the only place they reliably saw tree-kangaroos. In recent years, however, they have seen them so frequently around Shipton's Flat they now consider tree-kangaroos to be common in the area. My research confirmed that they were now resident and moderately abundant in these lowland forests. It also indicated that the abundances of the other major tree-kangaroo predators, Dingoes and Amethystine Pythons, were high. This implies that hunting by Aborigines had been the predominant influence keeping tree-kangaroos in low abundance in these lowland rainforests. However, my evidence was still thin; Aboriginal mythology and the stories of a few old men are given little credence as scientific evidence.

In 1990, together with Tim Flannery of the Australian Museum, I visited New Guinea to help ascertain the status of the

The Grizzled Tree-kangaroo is now the only common tree-kangaroo on Mount Somoro in north-western Papua New Guinea.

D PARER & E PARER COOK AUSCAPE INTERNATIONAL

Relocating Koalas is not always the most effective means of managing overpopulation.

recently discovered Black Tree-kangaroo *(Dendrolagus scottae)*. This species is now only found in the vicinity of Mount Somoro in the Torricelli Range, north-western New Guinea. It is a prized game species to the Olo people of the Torricelli Mountains, as Bennett's Tree-kangaroo used to be to the Kuku-Nyungkul on Cape York. We spoke with the men of Wilbete, a village on the lower slopes of Mount Somoro, and for the first time I was able to collect direct evidence of the impact of hunting on tree-kangaroo abundance. Fifty years ago there were three species living on the mountain but today only one species, the Grizzled Tree-kangaroo *(Dendrolagus inustus)*, appears to be common. Of the other two, one, a beautiful white-faced form of Goodfellow's Tree-kangaroo *(Dendrolagus goodfellowi)*, disappeared 50–60 years ago. It was remembered only by the old men who had seen it as children when it was hunted by their fathers. The trend with the second species, the Black Tree-kangaroo, was similar. While the most skilled hunters of the village were now lucky to take one a year, the old men, in their prime as hunters 30 years ago, took them freely. Overhunting appears to have driven the Black Tree-kangaroo to the point of extinction.

While the trends were in different directions, the parallels with Bennett's Tree-kangaroo were remarkable. In the Torricelli Mountains the decline in tree-kangaroos reflects the increase in hunting pressure. This correlates with the increase in the population of hunters (the New Guinean population is increasing at a rate of around two per cent per year) rather than with any change in hunting efficiency. The hunters still use dogs to find and kill tree-kangaroos, just like they have done for thousands of years. As well, the mythology of the Olo hunters once provided some sanctuary for the tree-kangaroos. They also had 'story places'–taboo areas on the mountain that they feared to visit–but Western missionaries have since exorcised the demons of these *'ples tambu'*. Now the only refuges left for the Black Tree-kangaroos are the steepest, most inaccessible slopes.

AMONG WHITE AUSTRALIANS THE HUNTing of wildlife has always been an emotional issue. It is particularly so at the present time. In Queensland the new Aboriginal land rights legislation will return many national parks to their traditional owners and the Kuku-Nyungkul people, the traditional owners of the Cedar Bay–Mount Finnigan National Park, have indicated their intention to resume traditional hunting. While there is no question of the cultural importance of this to them, it will mean that the abundance of tree-kangaroos in the accessible areas of lowland rainforest will inevitably decline. But it does not follow that the species will become less secure, provided the Kuku-Nyungkul people are able to nurture their myths and preserve their 'story places'. In this way they will remain wildlife refuges, as they appear to have been for many thousands of years.

The future management of Koala populations in Victoria is a far more challenging problem. With the constant loss of habitat, much of it to urban and coastal developments, most populations now occur in small isolated pockets and live at population densities far higher than they were at European settlement. In some of these populations, in the absence of predation, the only factor retarding population growth is low fecundity (birth rate). In the main this is caused by female infertility, resulting from disease caused by infection with *Chlamydia psittaci*, which

FORD KRISTO

Tranquillised Koala having a blood sample taken to test for chlamydial infection.

VENEREAL DISEASE

The Chlamydiae is a group of bacteria, widespread as pathogens of birds and mammals. Strains of one species, *Chlamydia psittaci*, cause disease of the reproductive tract and eye of the Koala. The bacteria are predominantly sexually transmitted and the reproductive tract appears to be the main site of infection. Female Koalas can harbour the organism in the lower levels of their tracts for many years without any apparent ill effects. However, when it ascends the tract the resultant inflammation usually causes sufficient damage to sterilise the female. In many colonies most of the middle-aged and old female Koalas are infertile as a result of chlamydial infection. The disease of the eye—a keratoconjunctivitis commonly known as 'pink eye'—can culminate in blindness, although many animals recover before the eye is seriously impaired. Both conditions appear to be more prevalent in colonies whose habitat has been disturbed.

JIM FRAZIER

Six-month-old Koala and mother.

is a widespread pathogen in mainland colonies (see box). In disease-free colonies, where the majority of females breed every year and the populations double every three years, the management problems are acute. Until now these colonies have been managed by regularly capturing and removing surplus animals. Since 1941 over 10,000 animals have been translocated. Serious doubts are now being expressed about the wisdom of continuing this policy. There are few areas of vacant habitat left and it is futile and possibly inhumane to release these *Chlamydia*-free animals into areas already occupied by infected Koalas. They have no natural resistance to *Chlamydia* infection, many suffer badly from it and almost all females become infertile after matings with infected males. There is also the question of swamping the gene pool of endemic populations by introducing animals

TIM FLANNERY

Papua New Guineans holding three species of tree-kangaroos. From left to right: the Grizzled, Goodfellow's and Black Tree-kangaroos. The Black Tree-kangaroo was only recently discovered by Tim Flannery.

from a few inbred colonies and the implications of this for the longer-term survival of the species.

The potent influence of hunting on tree-kangaroo populations has convinced me that Harry Parris' thesis was correct and Aboriginal hunters played the pre-eminent role in regulating Koala abundance in south-eastern Australia. It is now difficult to understand what constrained them from overhunting and exterminating the species. The surviving myths of the Kurnai, the tribe which occupied South Gippsland, give a clue. To them the Koala was 'muk-kurnai'–one of the eminent animals–and their stories linked it to the availability of water and the coming of the rains. According to William Thomas, an early Guardian of Aborigines in Victoria, they had rules as to how the Koalas were to be prepared before eating, and they believed there would be a severe drought if these were transgressed. While there is no evidence, one suspects that their mythological relationship with this eminent animal was so strong that it would also place constraints on their hunting activity. In our own culture it seems to me that the re-introduction of hunting, in the form of a controlled cull, is now the only sensible, humane and ecologically responsible way to manage some Koala colonies. Unfortunately, any attempt by wildlife authorities to implement such a policy would provoke a strong public reaction, much of it sustained by a narrow and squeamish view of ethics that has no ecological validity. ■

Suggested Reading

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Roger Martin is a Research Associate of the Department of Ecology and Evolutionary Biology at Monash University in Victoria. He now mainly works as a researcher-consultant on conservation and management issues affecting mammals.

Since we destroy vast tracts of funnel-web habitat, it seems only fair that some of them come to live with us in our gardens.

FUNNEL-WEBS: SEPARATING FACT FROM FICTION

BY MIKE GRAY

UP GOSFORD WAY THERE IS A PAPER-bark forest, a dense stand of low, twisted trees set in swampy ground that floods after heavy rain. Generally, such scrubby bush is of little interest, except to housing developers and biologists. Some years ago I wandered in among the closely spaced trees, examining their trunks on the off-chance of finding the nest of a Southern Tree Funnel-web Spider (*Hadronyche cerberea*). I was soon riveted by the realisation that almost every trunk contained the nest of at least

KATHIE ATKINSON

ANH

The Blue Mountains Funnel-web Spider
(Hadronyche versuta).

ANH

The female Sydney Funnel-web spider.

AUSTRALIAN MUSEUM

one funnel-web. In an area of little more than 300 square metres there must have been thousands of spiders! Given this, I was amazed to find the remains of a rough, bough-frame hut near the middle of this forest. Inside on the dirt floor was a rusty iron bed and old food cans. Somebody had been living there, spending their nights with several thousand of one of our most toxic species of funnel-web. Steven Spielberg, where were you? "Arachnophobia" had nothing like this! I checked for skeletons but there was none. Presumably, this person knew nothing about funnel-web spiders, especially the wandering habits of the males. It seems that in this case, ignorance really was bliss.

Some Sydney residents imagine their houses to be similarly besieged with funnel-webs. From time to time local newspapers reinforce these feelings with rousing headlines such as "Funnel-webs advance on Bankstown". In this case, the fact that Bankstown has never been an area where funnel-web spiders are common seems to be totally ignored. Of course, the hey-day of funnel-web journalism was prior to 1981 when no antivenom was available. In those days a death occurred on average every four to five years. The development of an effective funnel-web antivenom, although a severe blow to newspaper subeditors, was a great relief to ordinary Sydney-siders and has enabled us to take both a slightly more relaxed view of our funnel-webs, and even a perverse pride in their worldwide notoriety.

Funnel-web spiders remain deeply embedded in the psyche and folklore of Sydney. Indeed, the funnel-web has even inspired artistic impulses in such Australian cultural icons as Barry Humphries (Edna Everage's funnel-web cake) and Thomas Keneally (in his most recent book, *Women of the inner sea*). The brief funnel-web passage in Keneally's book touches upon a situation familiar to many Sydney residents – one's personal concerns about setting up house in a funnel-web area. This struck a chord because I sometimes get anxious calls from home-buyers about their choice of homesite. I can rarely give them much joy, most already having set their hearts on some funnel-web-ridden suburb. A simple real estate rule of thumb for Sydney is that the more desirable the area, the greater the funnel-web population. Historically of course, the man responsible for this sorry state of affairs was Captain Arthur Phillip. It was his decision, in 1788, to found Sydney on the shores of Port Jackson, right in the middle of the Sydney Funnel-web (*Atrax robustus*) distribution.

Part of the charm of our funnel-web

MIKE GRAY / AUSTRALIAN MUSEUM

A Southern Tree Funnel-web Spider exposed in its burrow on a paperbark tree. The four book-lungs (breathing organs) are clearly visible on the ventral abdomen.

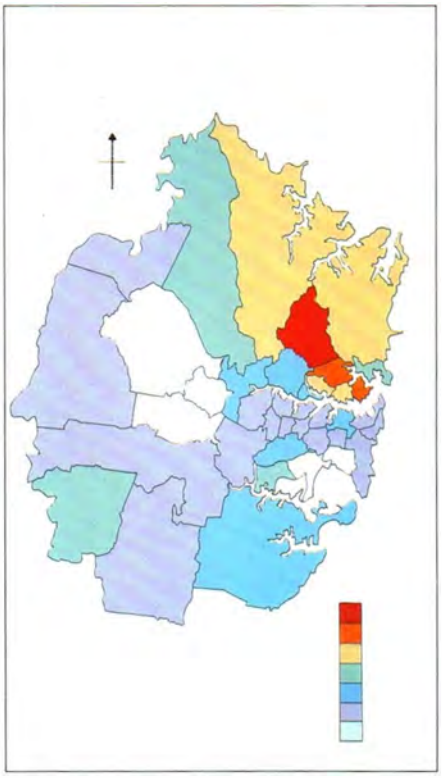
The development of an effective funnel-web antivenom was a great relief to ordinary Sydney-siders.

mythology is that much of it has some factual basis. But, as we know, facts are rarely allowed to get in the way of a good story. So let's look at the basis of some of these 'factual myths' and try to answer some basic questions about funnel-web spiders.

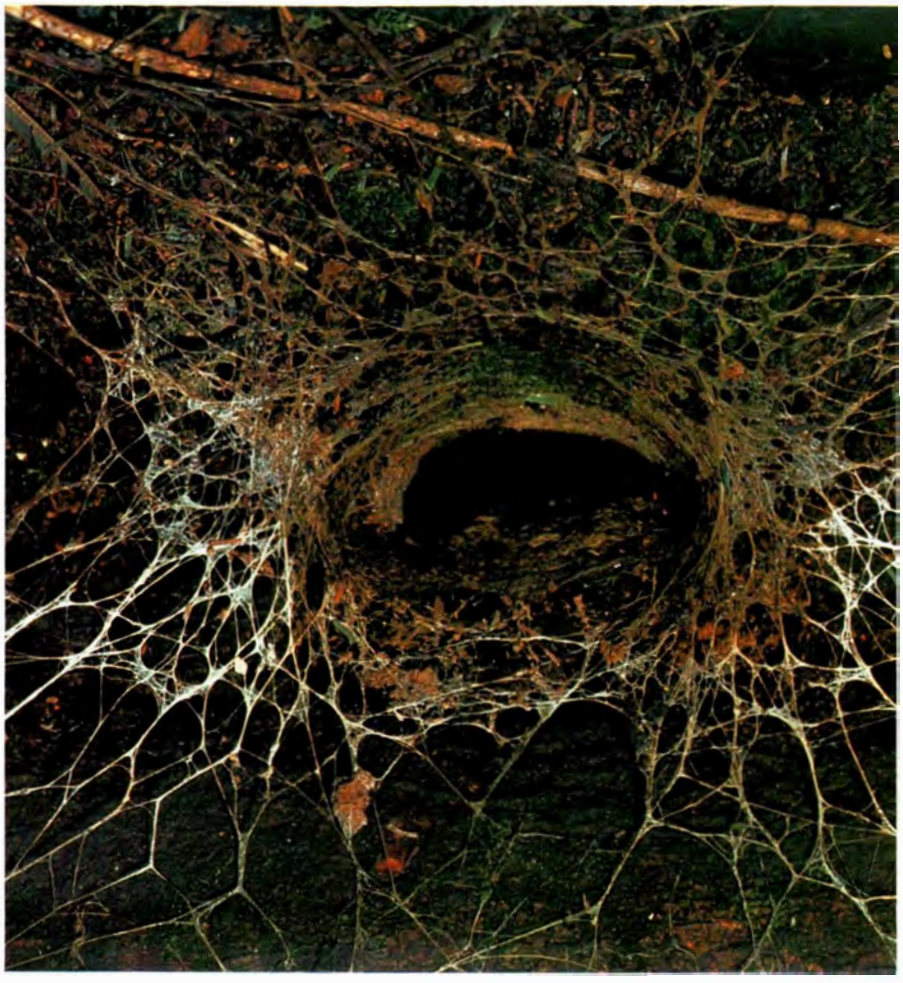
FIRST, IT IS USEFUL TO CLARIFY JUST where funnel-web spiders live. Geographically, funnel-webs occur in eastern Australia only, from the Daintree rainforests of northern Queensland to the dry open forests of the Eyre Peninsula, South Australia. They prefer the moister climates of highland and coastal regions, but in New South Wales have been recorded as far inland as Dubbo. The Sydney Funnel-web Spider is found from Newcastle to Nowra and west as far as Lithgow.

The comment is sometimes made that funnel-webs are 'advancing' and expanding their range. On the contrary: as Sydney and other eastern population centres expand, *we* invade more funnel-web areas, encountering spiders that probably have been there for millions of years. Since we destroy vast tracts of funnel-web habitat, it seems only fair that some of them come to live with us in our gardens.

The hoary old myth that Sydney Funnel-webs are only found on the 'North Shore' also has little currency these days. Funnel-webs can be found in most areas



A map of Sydney and suburbs showing approximately the relative abundance of Sydney Funnel-web Spiders. Colour scale: red to white, high to low.



R. MASCORD

A network of silk trip-lines radiates out from the entrance of a Blue Mountains Funnel-web Spider burrow in a log.

The extreme susceptibility of humans and other primates to funnel-web venom sharply contrasts with the mild reactions seen in other mammals.

of Sydney, but they especially favour the forested upland areas surrounding the lower, more open country of the central Cumberland basin. This includes the Hornsby Plateau to the north, the foothills of the Blue Mountains to the west, and the Woronora Plateau to the south. Funnel-web prevalence is low in much of central-western Sydney, and also the sandy coastal parts of the eastern suburbs and the Botany Bay area. They do better in areas of sandy clay, shale or basaltic soils that can retain moisture more effectively. Generally, funnel-web spiders prefer moist, cool micro-habitats under rocks and logs, in shaded banks or leaf litter, and sometimes in holes in tree trunks. Gardens, rockeries and dense shrubberies provide excellent funnel-web habitats, sometimes harbouring dozens of spiders in close proximity. They are only rarely found in more open situations like lawns.

If in doubt about the occupant of a silk-lined hole in your backyard, make this simple assessment: does the burrow's silk lining stop at the entrance rim, or are there some irregular silk 'trip-lines' running out from the entrance across the ground surface? Only the latter type belongs to a funnel-web. The characteristic trip-lines alert the spider, lurking in ambush just inside the entrance, to the presence of passing prey, mates or danger.

Many spiders fulfil the old adage that the female of the species, being larger, is more dangerous than the male. By contrast, in funnel-web spiders the size disparity between the sexes is not so great and in most species tested the toxicity of male and female venom is rather similar. A remarkable and important exception to this is the Sydney Funnel-web Spider, in which male venom is about five times more toxic to humans than female venom. Interestingly, funnel-web venom contains many chemical components (as do all spider venoms), and the venom molecule that effects humans so severely is quite different to the components that kill the funnel-web's normal prey (which ranges from insects and slaters to frogs and lizards). A similar situation exists for the venom of widow spiders (the Redback Spider and its relatives). One exotic widow spider has a venom component that shows particular toxicity for marine worms! This is as unlikely a prey item for a widow spider as is a human for a funnel-web. Such biochemical accidents are consequences of the 'chemical cocktail' nature of spider venom, which enables spiders to poison a diverse spectrum of normal prey. Also noteworthy is the extreme susceptibility of humans and other primates to funnel-web venom, in sharp contrast to the mild reactions seen in all other mammals. This should bring comfort to pet-lovers but it poses an interesting problem for religious fundamentalists and their notions of a 'special creation' for humanity.

FEMALES RARELY MOVE OUT OF THEIR burrows, but they do occasionally hunt on the surface at night. It is the male spiders that are the real wanderers, leaving their burrows after maturation to become vagrants of no fixed abode. Funnel-web spiders take two to four years to mature. Females are long-lived, some lasting perhaps ten years or more. By contrast, most males die about six to nine months after maturing. Hence, their frenetic nocturnal wanderings – the males will attempt to locate and mate with as many receptive females as possible to ensure the thorough propagation of their genes.

Male activity is concentrated in the summer–autumn period and most human encounters occur in this period. The male Sydney Funnel-web Spider's combination of wandering behaviour and an extremely toxic venom is a primary cause of serious human envenomations around Sydney. Males accidentally walk into garages and

houses, mostly via gaps under doors. Ground-level concrete slab houses are most at risk; fitting draft strips on outside doors is not a bad idea. Although most funnel-webs are not keen climbers, they are capable of scaling rough-textured walls and so occasionally may gain entry via unscreened windows. Once inside, funnel-webs rapidly lose body water in the dry house environment and can't survive for more than a couple of days. For the same reason you rarely find funnel-webs living in soil under houses – it's too dry and there is not enough food. Some other sensible precautions, especially during the summer–autumn 'funnel-web season', are as follows: check clothing and equipment stored in garages and sheds before use; check sandpits and swimming pools; don't walk around barefoot at night; wear gloves when gardening or cleaning up the yard; use a floored, zippered tent when camping in funnel-web areas; be aware of proper first-aid technique; and, don't panic!

In the unlikely event that you are bitten by a funnel-web spider, what happens and what should you do? Funnel-webs have large fangs connected to venom sacs in the jaw bases. These sacs are under muscular control and extruded venom droplets readily appear on the fangs of an agitated funnel-web. To use their fangs in feeding or defence, the funnel-web must raise the front part of its body and legs to allow the fangs to open downwards like daggers. The fangs can then be driven down with considerable force (in one instance penetrating the finger-nail of a victim) and several strikes can be delivered in quick succession. Naturally enough, with the trauma caused by the fangs and the acidity of the venom, such a bite is painful. However, for a variety of reasons not all bites have severe outcomes, even with Sydney Funnel-webs. For example, the venom supply may be low due to recent prey-catching activity, excessive venom shedding may have occurred during the agitated pre-strike phase, the spider may be a subadult etc.

Funnel-web venom contains a nerve toxin that must be distributed around the body to have its full effect. Without treatment signs and symptoms appear within 10 to 15 minutes and include tingling and numbness of the lips, sweating, salivation, eye watering, tongue twitching, nausea, stomach pain, vomiting and general muscle spasms, increased blood pressure and heart rate. Mental confusion precedes the onset of profound coma, during which blood pressure declines. Death probably results from brain damage due to lack of oxygen.

Funnel-web venom is mainly transported through the lymphatic system. Venom movement is thus effectively reduced by use of the pressure-immobilisation first-

MIKE GRAY / AUSTRALIAN MUSEUM

A male Southern Tree Funnel-web Spider.

MIKE GRAY / AUSTRALIAN MUSEUM

R. MASCORD

Left: male and female Sydney Funnel-web Spiders courting.

Northern Tree Funnel-web Spiders *(Hadronyche formidabilis)* mating. The male is in front.

BRETT GREGORY

Antivenom research—milking venom from a male Sydney Funnel-web Spider. Note the mating spurs on the second legs.

aid technique, as routinely used for snake bite. This involves the rapid and firm application of a pressure bandage (such as a long crepe bandage) wound over the limb from the bitten area upwards. A splint should be applied to immobilise the limb and the victim kept as quiet as possible. Unlike a tourniquet, such a bandage can be left in place for many hours without damage or excessive discomfort. It should only be removed under medical supervision.

The search for a funnel-web antivenom took many years. Research at the Commonwealth Serum Laboratories by Dr Struan Sutherland and his team was hampered by difficulties with identifying and refining the minor venom component toxic to humans, the loss of toxin activity when using normal laboratory glassware (this was solved by use of treated glassware and more acidic solutions), and the weak antibody response of standard test animals to venom exposure. In 1980 a last ditch attempt was made using a new technique to extract and concentrate the weak antibody response induced in rabbits injected with funnel-web venom. This was successful, and an antivenom was ready in December 1980, in time for the summer 'funnel-web season'. It saved the first seriously envenomated victim less than two months later and has been doing so ever since. The antivenom also has proven to be effective for bites of funnel-web species other than the Sydney Funnel-web Spider, and for bites by the unrelated Eastern Mouse Spider (*Missulena bradleyi*). More recently a venom research project supervised by Dr Merlin Howden at Deakin University has succeeded in producing an experimental funnel-web spider vaccine.

It may be of some comfort to know that not all funnel-web species are dangerous. Of the 35-odd species known, only a few (and notably the largest—the Sydney, Blue Mountains, Southern Tree and Northern Tree Funnel-web Spiders) have caused serious human envenomations. Of these, the Sydney Funnel-web alone is known to have caused deaths. This dubious record is attributable both to its highly toxic venom and its occurrence in the midst of the largest human population centre in Australia. The smaller species found in the Melbourne and Adelaide areas have never caused dangerous envenomations and probably pose little threat. Even so, it is safest to regard any funnel-web spider bite as potentially dangerous and treat it accordingly.

ONE OF THE MOST PERSISTENT BELIEFS about funnel-web spiders relates to their jumping ability. Having 'handled' hundreds of funnel-webs, I can say that this particular myth has the least basis in fact. The most I have ever seen one jump is about five centimetres. These little jumps are usually associated with extreme situations, as when the male is attacked by an unreceptive, and understandably 'aggro', female and a quick retreat is necessary. Funnel-webs will readily adopt a disconcertingly aggressive strike pose, legs raised, fangs open, venom dripping, when cornered or threa-

tened. This, admittedly, is a fairly effective strategy for dealing with people, but it is a last-resort defence reaction, not a prelude to jumping as some seem to think. Naturally enough, such feeble efforts come nowhere near claims like the two-metre leap once reported to me by some person calling from a pub!

Breathless claims have also been made that funnel-webs can survive days of immersion in swimming pools. A pool is like a gigantic pit-fall trap set in the ground to catch wandering funnel-webs. The spiders may also be attracted by the high humidity in the pool's vicinity. Immersion tests conducted at the Australian Museum show that Sydney Funnel-webs can survive 24 to 30 hours of full immersion. Upon removal from water, the spider is completely torpid and incapable of biting, but gradually recovers over an hour or so. The ability of the abdominal hairs to trap an air bubble around the abdomen (which contains the breathing organs) certainly must lengthen survival time. This bubble also allows the spider to float and so escape full immersion for some time. In Museum tests funnel-webs have floated for up to 44 hours. So, provided it floats, it is possible for a funnel-web to survive in a pool for over three days, making this one of the more factual of the funnel-web fables. Given this, it is not difficult to see why one interesting 1970s innovation in swimming pool design did not succeed in Sydney. This was a black-tiled pool that would absorb the sun's radiant heat and so warm up the water. A nice idea, but imagine checking for black funnel-webs in a black pool!

How effective is pesticide spraying? To spray or not to spray is an individual decision. I don't think it can be effective unless the spiders are very localised and accessible, as in a rockery perhaps. Spiders distributed sporadically around a garden in their sheltered, underground retreats are difficult to locate, and the blanket application of spray is undesirable. Also, wandering males from unsprayed areas can reinvade. Another problem is that, after spraying, more spiders of both sexes may be encountered than before. This is because the pesticide, at non-lethal dose levels, acts as a nerve stimulant and so increases spider-wandering activity (which also increases with other sorts of habitat disturbance such as heavy rain or excavation). Pesticides that kill funnel-webs also kill all the other innocuous and beneficial invertebrates in the garden—the 'innocent bystander effect'. They may even affect you or your pets. If you feel you must spray, make sure the spray used is not a long-term residual type. However, it's best to simply observe the precautionary measures outlined earlier. Remember, no-one has died from funnel-web bite since the funnel-web antivenom became available.

Perhaps at this point something should be said about catching funnel-webs. Normally, funnel-webs should be left alone

MIKE GRAY / AUSTRALIAN MUSEUM

Venom drips from the fangs of an angry, wandering male funnel-web spider, disturbed at the entrance of a female's burrow.

but, if one is found inside the house or if someone has been bitten, the spider should be collected for removal or identification. A wandering spider, often a male, should be approached with due caution, and at the end of a broom for the especially nervous. However, it is quite safe to gently approach the spider and place a wide-neck bottle over it. Slip a piece of stiff cardboard under both jar mouth and spider, and up-end the whole lot so that the spider is safely captured in the jar (don't forget to cap it). Live or dead specimens can then be taken to the Australian Museum for positive identification (still a free service!) and deposition in the collections for biological research; live specimens can also be donated via Gosford Reptile Park for the antivenom production program at the Commonwealth Serum Laboratories in Melbourne. A wad of moist cottonwool in the jar and avoidance of excessive heat and light will keep your funnel-web healthy for quite a while. If you just want to kill it, put the jar in the freezer for an hour or so.

For better or worse, the presence of funnel-web spiders lends a certain edge to life in Sydney. They will continue to cause minor medical emergencies but, without the protracted episodes of publicity surrounding fatal bites, their notoriety will lessen. Meanwhile, if you want to test your funnel-web tolerance levels at that Gosford paperbark forest, you'd better hurry. At my last visit in early 1992 there were signs advertising the swamp as a new housing subdivision. A great pity, in my view. More urban sprawl will replace a unique habitat remnant, valuable for future research (biological and pharmacological) on an important animal where it is numerous and accessible. Thinking laterally (and commercially, as we must these days), perhaps some such sites could be saved as attractions for controlled tourism. A simple boardwalk into the forest, ending at a feeding platform, is all that would be needed. The nests are highly visible and the spiders can easily be enticed to come out and feed at any time of day (unlike their ground-dwelling relatives). This is a spectacular sight. Japanese and other overseas tourists would probably love it—funnel-web spider feeding tours! Well, I'd like it, anyway. ■

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Her short life provides a demonstration of the immense problems involved in combining the role of wife and artist in 19th-century society before the notion of the career woman existed.

ELIZABETH GOULD

1804-1841

BY MAUREEN LAMBOURNE

JUST OVER 150 YEARS AGO, ON 16 MAY 1838, a young Englishwoman set out from London with her husband in the sailing barque *Parsee* on a two-year expedition to draw and collect material for a set of illustrated books on the birds of Australia. Her name was Elizabeth Gould, and her husband, John Gould, was then curator and taxidermist at the museum of the Zoological Society, London. They worked as a joint partnership, Elizabeth supplying the artistic talent and John the scientific knowledge and business acumen. The outcome of their travels, *The birds of Australia* (1840–1848), published in London and dedicated to Queen Victoria, was an outstanding financial and artistic success. Originally priced at £115 (about $A290) for the 36 parts with some 600 plates, the complete set now fetches over a thousand times as much and, at an auction in Melbourne in 1987 of prints from Gould's personal library, a double-paged print of a Satin Bowerbird by Elizabeth Gould went for $17,600.

Elizabeth's name has been dominated by that of her husband, partly due to his forceful personality, but chiefly because of her early death in 1841. She was only 37. During the following 40 years John Gould produced further lavish books on the birds of Great Britain, Asia and New Guinea, so that by the time he died, in 1881, Elizabeth's name and contributions had been almost forgotten. Ironically, even the Australian Gouldian Finch dedicated to her by her husband, despite the correct scientific name of *gouldiae* (the *-ae* shows it is named after a woman), bears the common name Gould and so ends up by commemorating the ornithologist himself!

ELIZABETH COXEN, CALLED BY HER HUSband Eliza, was born at Ramsgate, Kent, of a naval and military family. She had numerous brothers and sisters, but many died in infancy (including two Marys, an Ann and a Mary Ann). Two brothers, Stephen and Charles, emigrated to New South Wales and by the time she was 20, she was the only offspring left in England. Elizabeth became a governess, then one of the few professional occupations available for an educated woman and a role often described in novels of the time. A letter to her mother from James Street, London, reveals that she sometimes felt "miserably, wretchedly, dull" even though her pupil, a nine-year-old girl to whom she taught French, Latin, music and probably drawing, was "a perfect child in mind and manners". She felt isolated from society and, although her bedroom overlooked Buckingham Palace, she wrote, "& were it not that I see constantly *living* beings *really* moving backwards & forwards there I should fancy I was to be shut up here forever without knowing any one who could enter into one's feelings".

It is not certain how Elizabeth came to meet her future husband, but it may have been through a Mr Coxen 'the Birdstuffer' (probably a relation) of 12 Broad Street, London. He was a colleague of the enterprising John Gould, who had abandoned a career as a gardener to set up as a taxidermist. Gould showed such expertise that he received commissions from the royal family and, in 1829, had the important task of assisting in the dissection and stuffing of George IV's pet, the first Giraffe to live in England, which had unhappily died two years after its arrival from Egypt. In the same year the Goulds, both aged 24, were married at St James', Piccadilly, and for many years both Gould's publishing and taxidermy businesses were situated at 20 Broad Street, Golden Square, Soho.

Lithograph of Swift Lorikeet (*Lathamus discolor*) by Elizabeth Gould.

Oil portrait of Elizabeth Gould, by an unknown artist. She is holding a falcon.

John Gould in 1849.

The story of how Elizabeth came to illustrate their first book *Birds from the Himalayas* was related over 40 years later by Gould to Richard Bowdler Sharpe, his biographer. Soon after his appointment to the Zoological Society, Gould preserved and mounted a valuable set of bird skins from the hill districts of India. These aroused such interest at scientific meetings that he decided to make a permanent pictorial record. He discussed the need for illustrations by the new printing method of lithography with his wife Elizabeth, who asked "But who will do the plates on stone?" "Who?" replied her husband, "Why you, of course".

As Gould had no art training, and was not a skilled draughtsman, he relied greatly on his wife's artistic talents. Elizabeth soon learnt to be proficient at lithography or 'drawing on stone', which did not require the long training needed for engraving in wood or metal. She may have learnt the technique from Charles Hullmandel's manual *The art of drawing on stone* (1824), which advocated shading with lithographic crayons for tonal effects and the softness of fur and plumage. The title page shows an elegant young lady in a white dress seated at her desk holding a lithographic pencil—an indication that 'drawing on stone' was a suitable and not too messy accomplishment for an aspiring female artist. Elizabeth worked from Gould's quick sketches, and drew the outlines of the birds on prepared slabs of limestone, which were taken to Hullmandel's lithographic workshops near Broad Street to be printed. The outline prints were then hand coloured by professional colourists using Elizabeth's careful watercolour studies as references.

Elizabeth's first birds—the owls, tits, shrikes and jays in the Himalayan volume—perch stiffly on tiny mounds, tree stumps, or stubby branches in the conventional manner of 18th-century illustration. But gradually she depicted her models in a less rigid manner and the last Himalayan prints are richly coloured pheasants with elaborate, detailed spotted markings. Nicholas Vigors (who wrote the text and described the species) dedicated to her a rare Himalayan sunbird, *Cinnyris gouldiae*, which is still known today as Mrs Gould's Sunbird.

For the next project *The birds of Europe*, the Goulds travelled through continental Europe to see museums, private collections and meet eminent zoologists. In the summer of 1835, they sailed to Holland, up the Rhine to Frankfurt, travelled by road to Munich and Vienna, and returned to England via Salzburg and Switzerland. "Mrs Gould accompanied me", Gould wrote to a fellow naturalist, "and I am happy to say stood the journey remarkably well" (she was then in an early stage of pregnancy).

Gould employed Edward Lear, a natural history artist, later famous for his 'nonsense' verse and comic drawings, to work with Elizabeth in preparing *The birds of Europe* and *A monograph of the toucans*. Lear had previously illustrated a wonderful book of lithographs of parrots, and was particularly gifted at portraying the larger, more flamboyant birds, toucans, owls, eagles, pelicans and herons. He described Mrs Gould as "exceedingly pleasant and amiable" and helped her in the drawing of the foliage and foregrounds. The gaudy toucans were followed by *A monograph on the Trogonidae*, a family of birds that also lived in dense tropical forests but were less strident and more graceful. Elizabeth's 'Narina Trogon' is one of her most delicate compositions, and the 'Mexican Trogon', although more formal, is simple and elegant.

Encouraged by these successes,

Elizabeth asked "But who will do the plates on stone?" "Who?" replied her husband, "Why you, of course".

Elizabeth's name was overshadowed by her husband, John. Even the Gouldian Finch, which he dedicated to her by designating the feminine suffix for the scientific name *(gouldiae)*, ended up commemorating him!

The Narina Trogon *(Trogon narina)* from Africa, drawn and lithographed by Elizabeth Gould, was named after a Hottentot woman who was said to be beautiful, led a sad life and died young.

Gould, always restless, embarked on a larger enterprise. For several years he had been intrigued by the strange mammal and bird skins that arrived in London from Australia, and by fascinating accounts sent from Elizabeth's two emigrant brothers. A few natural history artists, such as the botanical illustrator Ferdinand Bauer (see ANH Autumn 1990), Midshipman George Raper, the convict Thomas Watling, and colonial artist John William Lewin, had already portrayed some Australian birds, with Lewin's *Birds of New Holland with their natural history* (1808) going into three editions and attracting considerable interest. But the extent of these early efforts was limited. Gould, therefore, was determined to be the first in the field to make a comprehensive list of species and, after issuing a *Synopsis* and two parts (later called the cancelled plates) of *The birds of Australia*, he decided to see the birds for himself, and take Elizabeth with him as his artist.

For Elizabeth, who loved her children, it was a great wrench to be parted from her young family. Arrangements were made for the care of the three youngest: Charles, aged four (who would at the age of 26 become first Geological Surveyor of Tasmania), was sent to a boarding school, while two-year-old Lizzy and six-month-old baby Louisa were looked after at Broad Street by Elizabeth's mother, her niece and husband. The eldest boy Henry, aged seven, accompanied his parents; and a nephew, two servants and Gould's assistant, John Gilbert, completed the party. Although Elizabeth had agreed to be with her husband, she was frequently homesick and longed to hear details from home of her children's health and progress. "I hope my dear little Louisa is not suffering from her teeth. How does my Charley like school and does Lizzy look as rosy as before her illness?" she asked her mother in one of a series of letters, which are of great human interest and now belong to the Mitchell Library, Sydney.

During the four-month voyage Elizabeth was not allowed much time to be idle. Gould arranged for a cabin to be equipped with storage cabinets, drawing apparatus and reference materials, so that ornithological work could be carried out on board. In calm weather, Gould, lowered in a boat from the side of the ship, caught sea birds by baited hook and line, and Elizabeth made careful watercolours of them, including several species of petrels and albatrosses.

The Goulds were welcomed in Hobart, Tasmania, by the Governor and his wife, Sir John and Lady Franklin, who were both keen to promote natural history interest, despite the wranglings of internal politics. Elizabeth wrote home that the country was "teeming with beautiful natural productions, both in the animal and vegetable kingdom". The dynamic, intellectual Lady Franklin—the first woman to climb Mount Wellington, and founder of a botanic garden and museum near Hobart—eagerly planned expeditions for Gould to see birds in various parts of the island. John explored Tasmania, visited New South Wales and South Australia, while Elizabeth remained in Hobart, staying at Government House during the pregnancy of her third son. To her mother she wrote about the grand ball to celebrate the Queen's birthday. "Can you imagine such a shy, reserved being as myself frisking about in the midst of 200 people? Don't fancy I attempt dancing—no, no. I am well content to look on". She much preferred to collect local plants and

Superb Lyrebird *(Menura superba)* drawn and lithographed by Elizabeth Gould.

blossoms in the surrounding grounds and gardens, which she drew as appropriate backgrounds for her bird pictures. She also drew lorikeets, honeyeaters, and some little Tasmanian owls and owlet-nightjars that were kept for a short time in captivity. Elizabeth remained in good health, due to the pleasant climate and Lady Franklin's hospitality, and the baby, christened Franklin, was "a prodigious fellow". He soon became "a great pet with all in the family" and later, Lady Franklin, herself childless, thought of adopting him, but Elizabeth refused to part with her "little Tasmanian".

In August 1839, the Goulds, with their son and baby, left Tasmania for New South Wales to see Elizabeth's brothers. Elizabeth's entries in a short diary reveal that her travels were very much working holidays. They sailed first to Sydney, where they visited the Botanic Gardens, then travelled by steamer to Newcastle. On Mosquito Island, at the mouth of the Hunter River, Gould ordered a tent to be pitched in a bush clearing, where Elizabeth drew plants and the soft parts (bills, legs and feet) of recently shot birds in order to capture their colours before they faded. The family next continued up the Hunter River by boat to Maitland, where Elizabeth "drew all day" for three days, her labours relieved by walks in the cool of morning or evening. From Maitland they travelled by bullock cart to the Coxens' property at Yarrundi. There Elizabeth continued to draw and tend to the children while Gould set out into the bush on his most successful and ambitious journey to discover new species in the sparsely settled country.

Elizabeth correctly prophesied that the great mass of material accumulated by her husband would be of immense interest to the scientific world. After their return to England on 18 August 1840, Gould exhibited skins and described the bowerbirds' habits at zoological meetings, and at social soirees showed off his live "pretty singing New South Wales parrots". The latter sprightly birds were probably the Budgerigars given to him by his brother-in-law, Charles Coxen, and believed to be the first breeding pair of 'Budgies' in England. A Cockatiel also brought back from Australia was for many years a pet in the Gould family.

The birds of Australia was once again quickly set in action, the two parts previously printed were cancelled, and the first part of the new edition came out in December 1840. The parts were issued at three-monthly intervals, each consisting of about 17 plates and text placed in a folder, with a cover design of a lyrebird based on Elizabeth's lithograph. Eighty-four plates are credited to her, but her bird studies and botanical drawings provided invaluable source material for numerous other illustrations, even 40 years later in the *Birds of New Guinea* (1875–1888). In May 1841, Gould rented a cottage at Egham by the Thames where he hoped the family would benefit by a holiday in the country. But the pressure of work, added to by the responsibility of her young children, may have combined to undermine her health, for tragically she died in August, aged 37, from puerperal or childbed fever five days after the birth of her eighth child, Sarah, the sixth to live past infancy. Puerperal fever was later found to be caused by uncleanliness on the part of the doctor or midwife.

THROUGHOUT THE REST OF HIS LIFE Gould paid her heartfelt tribute, and in the *Handbook to the birds of Australia* (1866) expressed the "purest affection for my late wife, who for many years laboriously assisted me with her pencil, accompanied me to Australia, and cheerfully interested herself in all my pursuits". To his naturalist friend, Sir William Jardine, he wrote: "All and everything is secondary

to her faithful, gentle, and amiable Christian disposition". Although shattered by her death, he was determined to continue his ornithological publications, and after a search found the young H.C. Richter, whom he trained to work to the same standards set by his wife. One of Richter's illustrations is of the rainbow-coloured Gouldian Finch *(Erythrura gouldiae)*, found in the Northern Territory by John Gilbert, Gould's explorer, and dedicated to Elizabeth in memory of her work in Australia.

Edward Lear, who had given up zoological painting for landscape, asked Gould for "a little sketch . . . as a memorial of a person I esteemed and respected so greatly". In his last years when he was often lonely, embittered and cantankerous, Lear recalled unhappy memories of his earlier days at Broad Street. He remembered Gould as outwardly jolly, but also "harsh and violent", who owed "everything to his excellent wife, & to myself,— without whose help in drawing he had done nothing". Other contemporaries remarked on their complementary personalities. Lady Franklin's initial impression of Elizabeth was of a "very unassuming and diffident person" whereas her husband was described by the colonists as "fully conscious of his importance as a lion". The American bird illustrator John James Audubon thought Gould was "rich and renowned" and his wife a "plain, fine woman" (inferring that she was not a fashionable society lady) and a "skilful lithographer of his birds". Elizabeth, modest about her own talents and retiring by nature, was surprised by the praise given to her bird illustrations. One of the most precious compliments paid to her was from Prince Charles Lucien Bonaparte, an eminent naturalist and nephew of the Emperor. He promised her a fine cameo from his own collection in Italy, but sadly it arrived in England by messenger shortly after her sudden death, and instead was presented to her five-year-old eldest daughter.

The cameo brooch sent to Elizabeth Gould.

During 12 years of marriage Elizabeth produced over 600 illustrations for her husband's bird books, had a family of six children, and circumnavigated the world. Her short life provides a demonstration of the immense problems involved in combining the role of wife and artist in 19th-century society before the notion of the career woman existed. Was Elizabeth Gould overstretched due to her compliancy to Gould's demands? Has her name as an artist in her own right been overshadowed? ■

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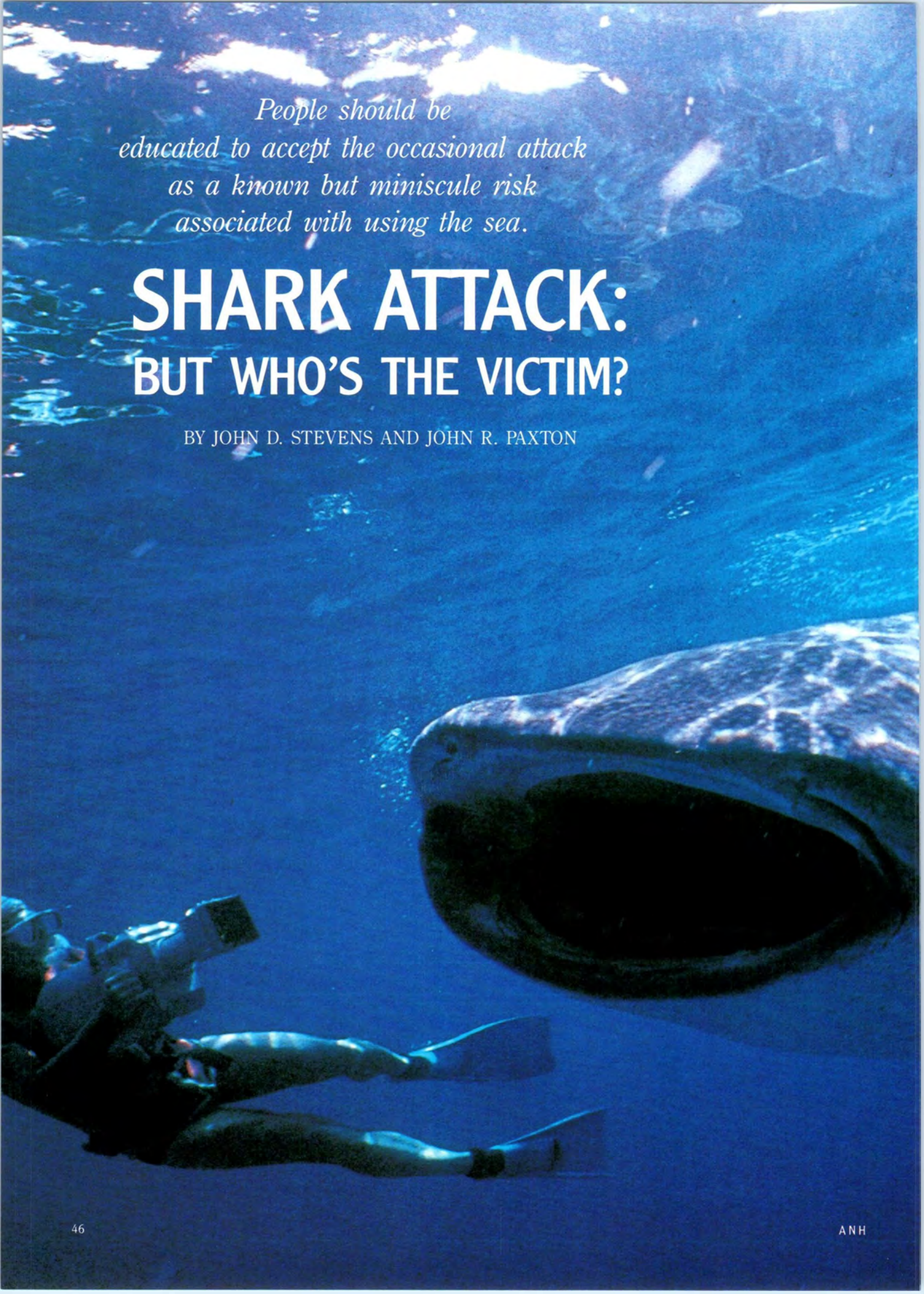
Maureen Lambourne is a great-great granddaughter of John and Elizabeth Gould. She has written several books about the Goulds and other natural history artists. After taking a degree in Fine Art at Reading University she worked in the Prints and Drawings Department at the Victoria and Albert Museum, London. In her spare time she enjoys watercolour painting and bird watching.

People should be educated to accept the occasional attack as a known but miniscule risk associated with using the sea.

SHARK ATTACK: BUT WHO'S THE VICTIM?

BY JOHN D. STEVENS AND JOHN R. PAXTON



The Whale Shark (*Rhincodon typus*), a plankton feeder, is the largest living fish. It is one of many sharks considered threatened by human activities.

RON & VALERIE TAYLOR / ANT PHOTO LIBRARY

SHARKS ARE SEEN AS PRIMITIVE, vicious, mindless eating-machines to be killed at every opportunity. In part these feelings are related to the threat (real or perceived) these animals pose to humans and, at the extreme, the fear of being 'eaten alive'. We can make a useful analogy between the fear of sharks and the fear of flying; most people are, at the least, apprehensive if not downright frightened about both (even though they may not admit it), although sharks and flying are a miniscule source of human mortality. The negative image of sharks has worked against them so that, even if they are no longer the subject of personal vendettas (as was the case in the post "Jaws" era), there is indifference to their future plight.

In the last few years, in the light of more factual reporting by the media, together with more accurate information about sharks and the general conservation ethos, attitudes are changing. People are finally appreciating sharks as superbly adapted and successful predators that play a vital role in marine ecosystems. Rather than dwelling on the grossly inflated phenomenon of shark attack, attention is being focused on the fascinating biology of these animals with their diversity of body form and feeding mechanisms that have enabled them to succeed as the top predators of most major marine habitats.

Sharks have a battery of sophisticated prey-locating sensory systems, including vibration detection and a bioelectric sense. They have a variety of reproductive methods that range from bizarre egg-eating and intra-uterine cannibalism (where an embryo eats the other eggs and embryos in the uterus, resulting in the birth of only one large pup) to placental live-bearing remarkably similar to our own. They also possess relatively large brains, complex behaviour and social structure.

Sharks play a similar role in marine ecosystems to the birds of prey in the air or the big cats on the African plains. Predators control the number of prey and maintain the genetic 'fitness' of the prey species by taking the weaker or less well-adapted individuals. In turn, the abundance of prey indirectly controls the number of predators. Any ecosystem is an amazingly complex and finely balanced blend of all the plants and animals in it. Removal of a key species such as a top predator, or introduction of an exotic species with no natural predators, can throw the system out of balance.

Today, as never before, sharks and their relatives, the skates and rays, are facing an increasing threat from humans. For every person killed by a shark, over

H.G. DE COWET / AUSCAPE INTERNATIONAL

Diver and Zebra Shark (*Stegostoma fasciatum*).

Diver with baby Port Jackson sharks (*Heterodontus portusjacksoni*).

KEVIN DEACON / AUSCAPE INTERNATIONAL

23,000 tonnes of sharks and rays are killed through commercial and recreational fishing and shark control programs such as meshing of swimming beaches.

WHY ARE SHARKS PARTICULARLY VULnerable to fishing pressure? Associated with their predatory lifestyle sharks have adopted a reproductive strategy that relies on the production of relatively few, large, well-protected young. The range of young produced in a reproductive season ranges from two in such sharks as the Grey Nurse (*Carcharias taurus*) and some whaler sharks (*Carcharhinus* spp.) to a maximum of 135 in the Blue Shark (*Prionace glauca*). By contrast, some bony (as opposed to cartilaginous) fishes such as the North Atlantic Cod (*Gadus morhua*) produce millions of eggs, a much smaller proportion of which need to survive to maintain the species' population size. In nature these are just two different strategies; the differences become a problem when fishing is introduced. For some bony fishes, for example, it is possible to fish stocks down to very low levels, but still have enough eggs to replenish the stock. But if you halve an adult stock of sharks, then you come close to halving the number of young produced. While some shark species breed every year, others breed only every other year or even less frequently. Sharks also have generally slow growth rates and a late age of sexual maturity; many species do not mature until they are 10–12 years old. Clearly the replenishment rate of shark populations is low, and the maximum sustainable yields for commercial shark fisheries are heavily influenced by shark birth rates.

Sharks are an important source of protein in many parts of the world. In addition to their meat, other parts of the sharks are highly prized. These include the oil in their livers (used as a lubricant and in cosmetics), their cartilage (used for the treatment of burns and in anti-tumor research), corneas (for human transplant operations), gall bladder extracts (for acne treatment), and their fins (used in shark-fin soup). Recent high prices of over $100 per kilogram for shark fins have made it profitable to target sharks specifically for their fins. Smaller markets exist for shark leather, and for jaws, teeth and vertebrae as curios.

The markets for shark products are supplied either by target fisheries, that is fisheries directed specifically at the species in question, or through bycatch fisheries where the sharks are caught incidentally to the desired species. Historically target shark fisheries have had a chequered career often following a 'boom and bust' pattern. Rapidly increasing catches were followed a few years later by declining catch rates due to depletion of the local stocks to the point where the fisheries became uneconomic. The

BILL BACHMAN / ANT PHOTO LIBRARY

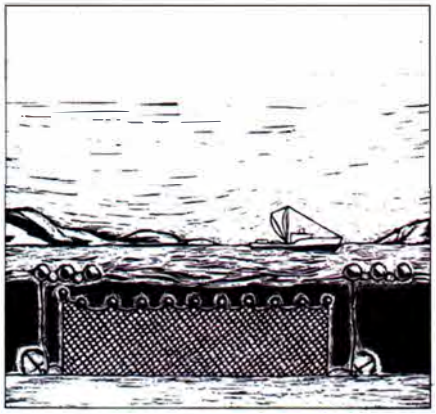
problem of overfishing is still occurring in most shark fisheries today.

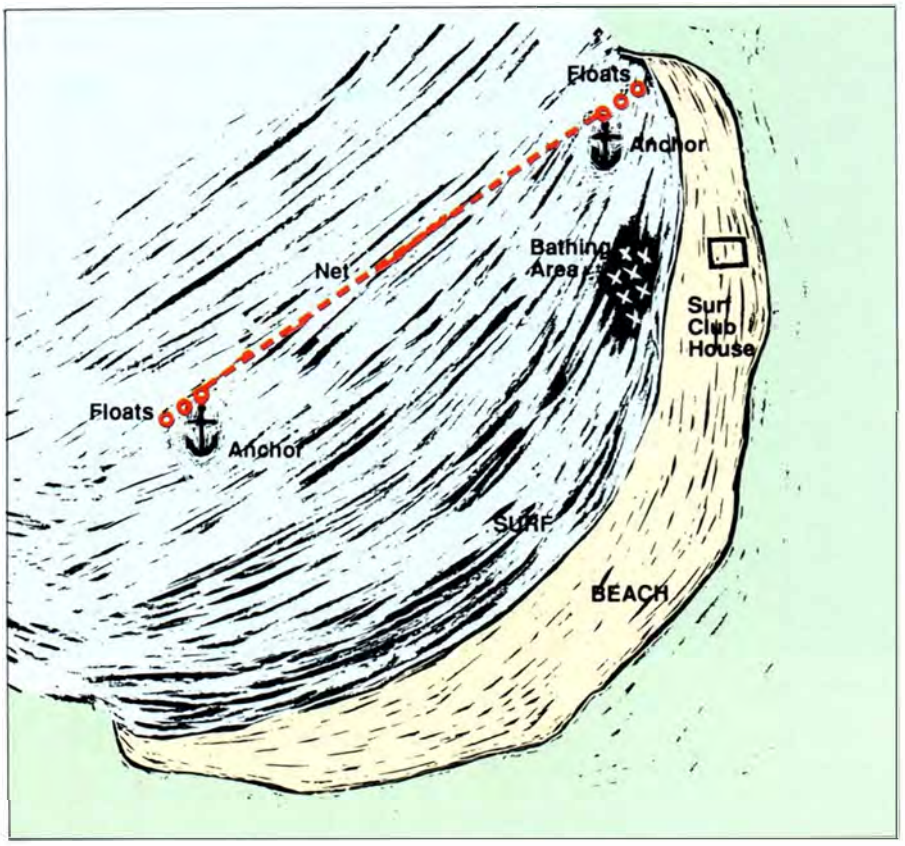
Until recently the southern Australian shark fishery produced about 5,000 tonnes annually of School and Gummy Sharks (*Galeorhinus galeus* and *Mustelus antarcticus*). This $20 million fishery has had an unusually long history dating from the early 1900s. For a number of years scientists have warned that the stocks are being severely depleted and that the fishery faces economic collapse. While most fishermen agree that restrictions are necessary, many have difficulty reconciling severe depletion with the long history of the fishery and their own catches, which some claim are as high as ever. The scientific counter-argument is that, although the fishery has existed for a long time, it has undergone periods of expansion followed by periods of decline allowing some recovery of the stocks, and it is only recently with much improved technology and stable demand that fishing effort has increased dramatically.

Bycatch fisheries for sharks are in many ways of even more concern than directed fisheries, because the catch is usually poorly documented. Massive quantities of sharks are taken by the high-seas longliner and driftnet fleets of nations such as Japan, Korea, Taiwan and Russia. These vessels usually target species such as tuna or squid, but retain the high-priced low-volume shark fins while trashing most of the carcasses that would otherwise compete for the limited freezer space. It has been estimated that some 34,000 Blue Sharks are taken by Japanese tuna longliners each season off Tasmania alone. Estimates from Greenpeace suggest that the north Pacific driftnet fleets may catch in excess of two million Blue Sharks annually! While Blue Sharks are an abundant and widely distributed species, no-one knows what impact these huge catches are having either on the Blue Sharks themselves or on the oceanic ecosystem of which they are an integral part. Australia has made some attempt to restrict fin removal by the Japanese within the Australian Fishing Zone by prohibiting the retention of fins unless the whole carcass is retained. However, the legislation is largely token and will do little to prevent the killing of the sharks even if the fins are not kept.

Large numbers of sharks are also caught by sportfishermen, particularly in the USA and Australia. Off California, the recreational catch of Leopard Sharks (*Triakis semifasciata*) is estimated to be six times the commercial catch. In the past the sharks were caught, weighed for competition purposes and then dumped back into the sea. More recently there has been a welcome trend towards tag and release competitions, which can still provide sport without killing the sharks and at the same time provide useful biological information. Most angling clubs and

A recreational fisherman with catch: a species of whaler shark.





Shark nets used on Sydney's surf beaches are designed to trap and kill sharks that run into them. They are not designed to stop sharks entering the beach area. Loosely hanging nets are anchored in water about six metres deep.

fishermen now realise that they must adopt a more responsible attitude both to conserve the stocks for their own sport and to avoid a growing criticism from conservation bodies and the general public. Recreational spearfishing had such an impact on the population of Grey Nurse Sharks off New South Wales that the species is now protected. Also the Great White Shark (*Carcharodon carcharias*) has recently been declared an endangered and protected species in South Africa.

THE CONSERVATION OF LARGE CARNIvores that impact on human populations, such as tigers, crocodiles and sharks, is a contentious issue. Few informed people would urge that these species be slaughtered to extinction. Many of these animals are endangered, and some are protected. For sharks, what is required is enlightened public debate on the value of each species, the actual *versus* the perceived risk to humans, how best to minimise that risk, and the methods and consequences of protecting threatened species.

Although the potential threat of sharks attacking humans occurs around the world, only two countries—Australia and South Africa—have resorted to beach meshing, which, in New South Wales, involves the use of a 150-metre-long net set parallel to the beach and near the bottom, about 500 metres offshore. Beach meshing works by catching sharks, reducing the population size and thus the statistical chances of attack; *they do not prevent sharks from entering the surfing beach environs*. (This is in contrast to the 'shark-proof' swimming areas at Balmoral, Nielsen Park and other Sydney Harbour beaches where the finer-meshed nets completely enclose the areas, and are not designed to catch sharks.)

Beach meshing in Australia is limited to the States of New South Wales and Queensland. It was introduced to beaches

School and Gummy Sharks caught in nets to be sold for human consumption.

DAVE WATTS / ANT PHOTO LIBRARY

REG MORRISON / AUSCAPE INTERNATIONAL

A netted shovelnose ray.

of New South Wales in 1937, Durban (South Africa) in 1952, and Queensland in 1962. Following the introduction of beach meshing, catches were typically high for a couple of years before levelling off. More than 1,000 sharks were caught in the first 12 months of meshing off Sydney surfing beaches alone; meshing currently catches about 150 sharks per year off the beaches of Sydney, Newcastle and Wollongong.

While there is no question that meshing has been associated with a major reduction of shark attacks (there have been no fatal attacks on Sydney surf beaches since meshing began), the practice is extreme overkill. Also, other factors may have influenced the number of attacks prior to meshing. For example, in Queensland a number of attacks were associated with discharges from an abattoir in Townsville, and the Homebush abattoir on Sydney Harbour attracted numerous sharks. Discharges of this nature are now prohibited in both States.

In Australia, shark meshing costs well over $600,000 per year and yet no effort is made to use the sharks for scientific or other purposes. Some basic data are collected before the carcasses are dumped, but are of little use because the species identifications are so poor. At least in South Africa, meshing is linked to a scientific program that has provided valuable data on shark biology and distribution.

Of major concern is the bycatch from shark meshing. Between 1972 and 1978 in Queensland the nets killed at least 10,889 rays, 2,654 turtles, 468 Dugongs and 317 dolphins. Many of these are protected species, and some such as the Dugong are considered critically endangered. It is an undeniable fact that the impact of shark nets requires urgent assessment, both on the bycatch problem and the effect on the ecosystem of removing sharks.

The current concern about shark conservation has prompted one State, New South Wales, to review its beach meshing program. It is a sad fact that, after more than 50 years of shark meshing, we have no idea of the sizes of the populations of the shark species involved, nor of the optimum population sizes that would result in an acceptable level of attack. We will not be able to obtain this information until meshing is stopped for a period of time so that catch rates can be compared, and tag and release and other research initiated. Research into the effectiveness of meshing is urgently required, as is more research into shark behaviour and biology, and alternative methods of reducing shark attack.

ACCIDENTAL CAUSES OF HUMAN DEATHS IN AUSTRALIA, 1980–1990

Activity	No. Deaths	Average / year
Crocodile attacks	8[1]	0.7
Shark attacks	11[2]	1.0
Lightning strikes	19[3]	1.7
Bee stings	20[3]	1.8
Scuba diving accidents	88[4]	8.0
Drownings and submersions	3,367[3]	306.1
Motor vehicle traffic accidents	32,772[3]	2,979.3

[1] From Dr Graham Webb, Darwin.
[2] From John West, Shark Attack File, Taronga Zoo, Sydney.
[3] From the Australian Bureau of Statistics, Canberra.
[4] From Dr Doug Walker, Operation Sticky Beak, Sydney.

For shark attack, the perception of the threat far outweighs the real risk. More people are killed annually by bee stings or lightning strikes than shark attacks (see table). Although many more drown each year, swimming is not made illegal. Our traffic fatality rate is massive (about ten per week in New South Wales alone). Imagine the public outcry if there were ten fatalities from shark attack *each year*. (It is apparently acceptable to kill ourselves through automobile accidents, but the consequences are immense if another species does the killing.) In fact, the number of deaths in Australia from shark attack totals 11 for the years 1980–1990, slightly more than the eight deaths from crocodile attacks in the same period—yet the Saltwater Crocodile is considered an endangered and totally protected species. Last summer a small pack of sharks off

The Grey Nurse Shark is a protected species in New South Wales.

KELVIN AITKEN / ANT PHOTO LIBRARY

Manly resulted in shark alarms, police helicopters and surf boats attempting to scare the sharks to sea. All swimmers left the water safely, and no damage was done to the sharks. Surely this is preferable to the indiscriminate killing that currently occurs with shark meshing.

Ideally, people should be educated to accept the occasional attack as a known but miniscule risk associated with using the sea. Already Grey Nurse Sharks are protected in New South Wales, Great White Sharks are protected in South Africa and a newly established Shark Survival Group has been set up as a branch of the International Union for the Conservation of Nature. Perhaps at long last things are changing for the shark. ■

Dr John Stevens is a shark biologist and a Principal Research Scientist with the CSIRO Fisheries. He is currently investigating the inshore nursery areas of commercially important School and Gummy Sharks in south-eastern Tasmania. Dr John Paxton is a Senior Research Scientist at the Australian Museum where he has been studying Australian and deep-sea fishes for more than 20 years. Both are members of the IUCN Shark Survival Group.

Suggested Reading

Cliff, G. & Dudley, S.F.J., 1992. Protection against shark attack in South Africa, 1952–90. *Aust. J. Mar. Freshw. Res.* 43: 263–272.

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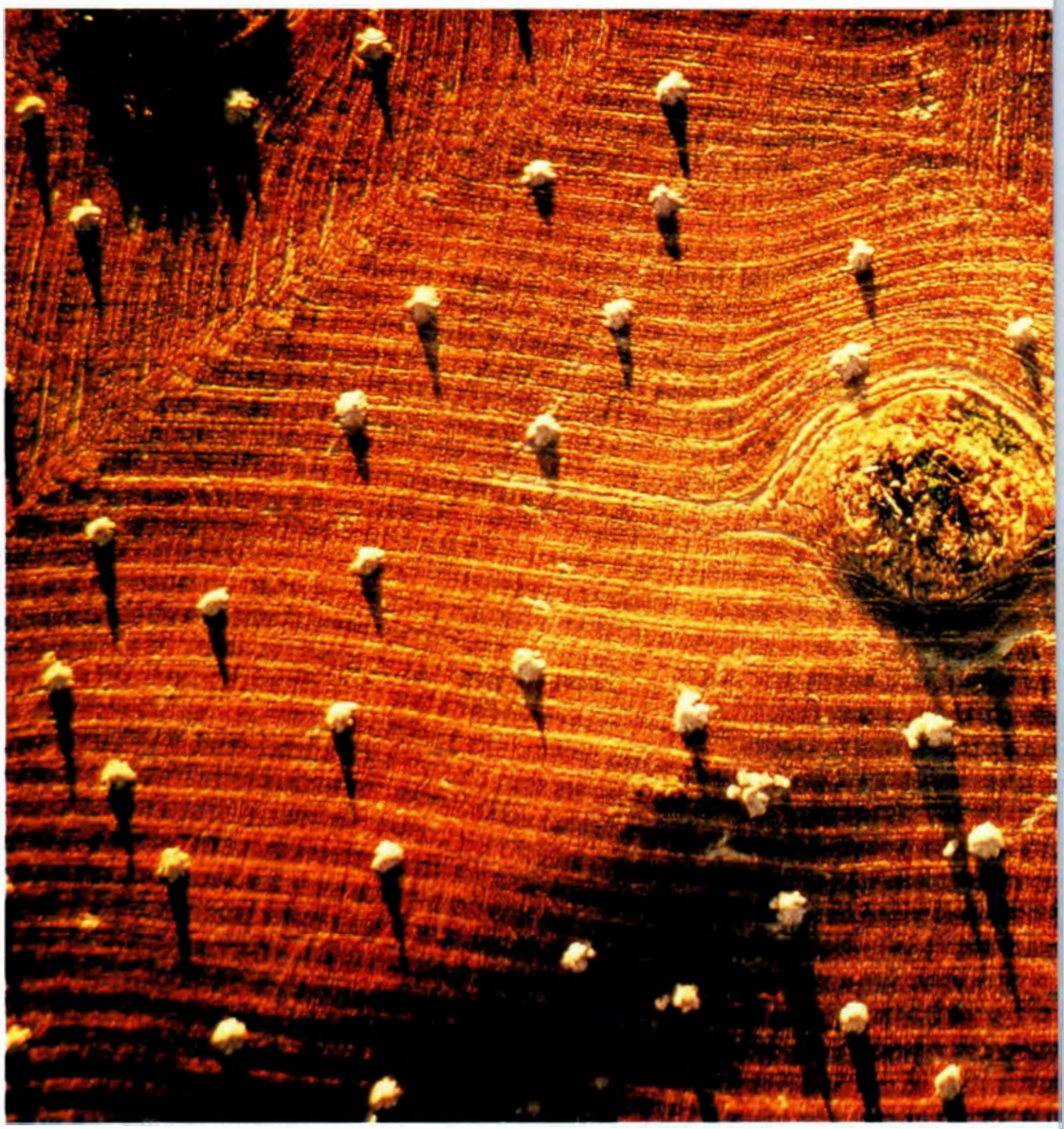
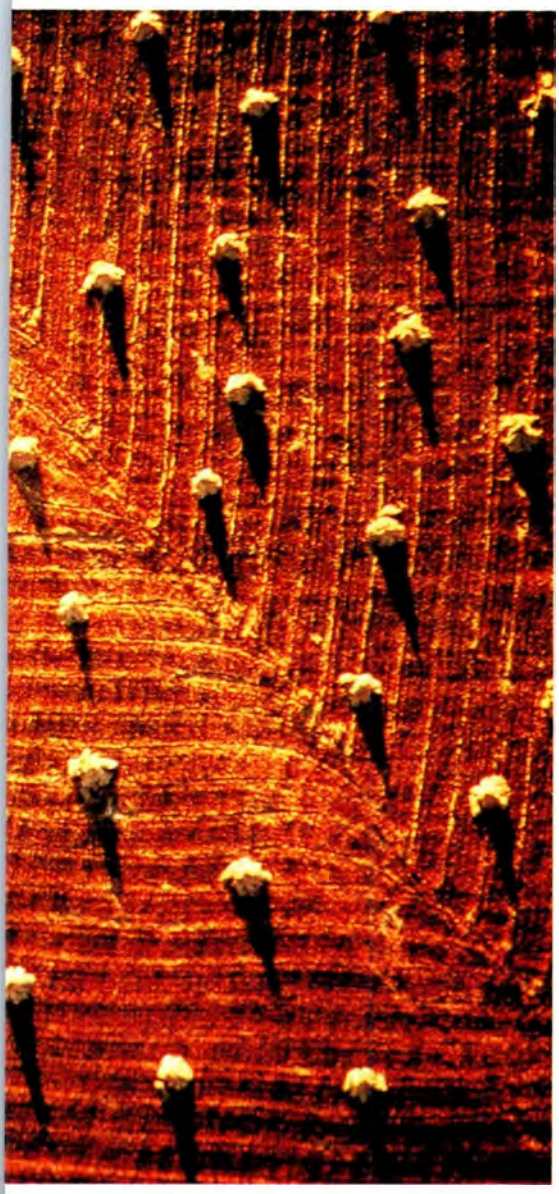
P H O T O A R T



Hay gathered for stacking.

Frosted paddock at first light.



Fire has turned this forest into a tapestry of regrowth.

AERIAL ESCAPES

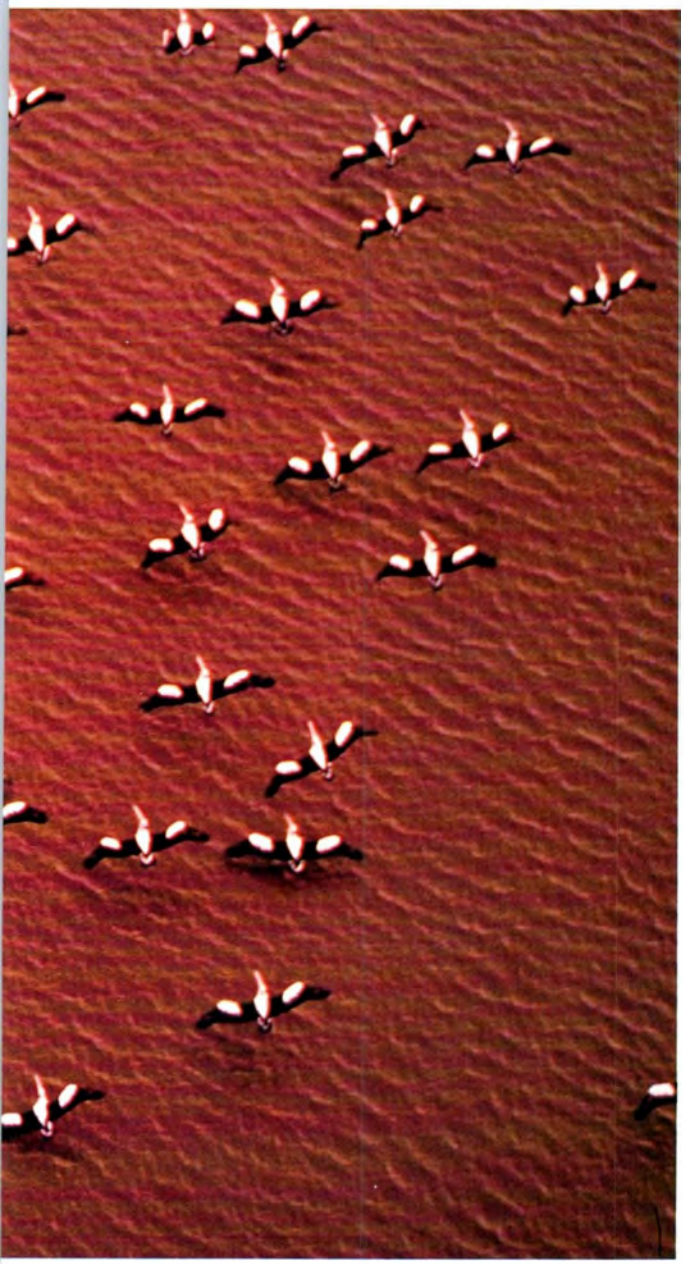
BY LINDSAY STEPANOW

HOW MANY OF US HAVE DREAMT OF flying? To rise above the fences and Hills Hoists, over church spires and rooftops, to drift away over the city? To hover above country lanes, farms and mountains, to go with the birds and wafting summer breezes...to the wilder places...then swoop down to admire it all in finer detail? After years of flying light aircraft, I decided to capture some of the images that passed beneath my wings.

My aerobatic flight training has taught me to fly the aircraft solely by outside reference, so I can concentrate on photography. Most of my photographs are taken between 150 and 900 metres altitude around Victoria.

Upon seeing a potential picture, I fly into position, transfer the control stick to my left hand, while holding the camera with my right; the lens resting on my left elbow and viewing through an opening vent in the canopy. Vibration is only a problem if the

Sheep on the move.



Pelicans in formation.

Saltbush and rising salt claim a pasture in western Victoria.

AERIAL ESCAPES

camera or the arm holding the camera is in contact with the aircraft frame.

From above, the limits of our environment are all too obvious: those precious few hundred metres between the topsoil and clouds are all we have. Fires frequently smudge large swaths of forests into crazy abstracts of ash white, charcoal and orange...vast landscapes of crisp desolation. In the wetter seasons, sheets of shallow water cover the flatter wetland areas in a shimmering liquid, creating muted water-colour hues. After the slumber of winter, flocks of birds return to the wetlands, forming vast clouds of life in motion.

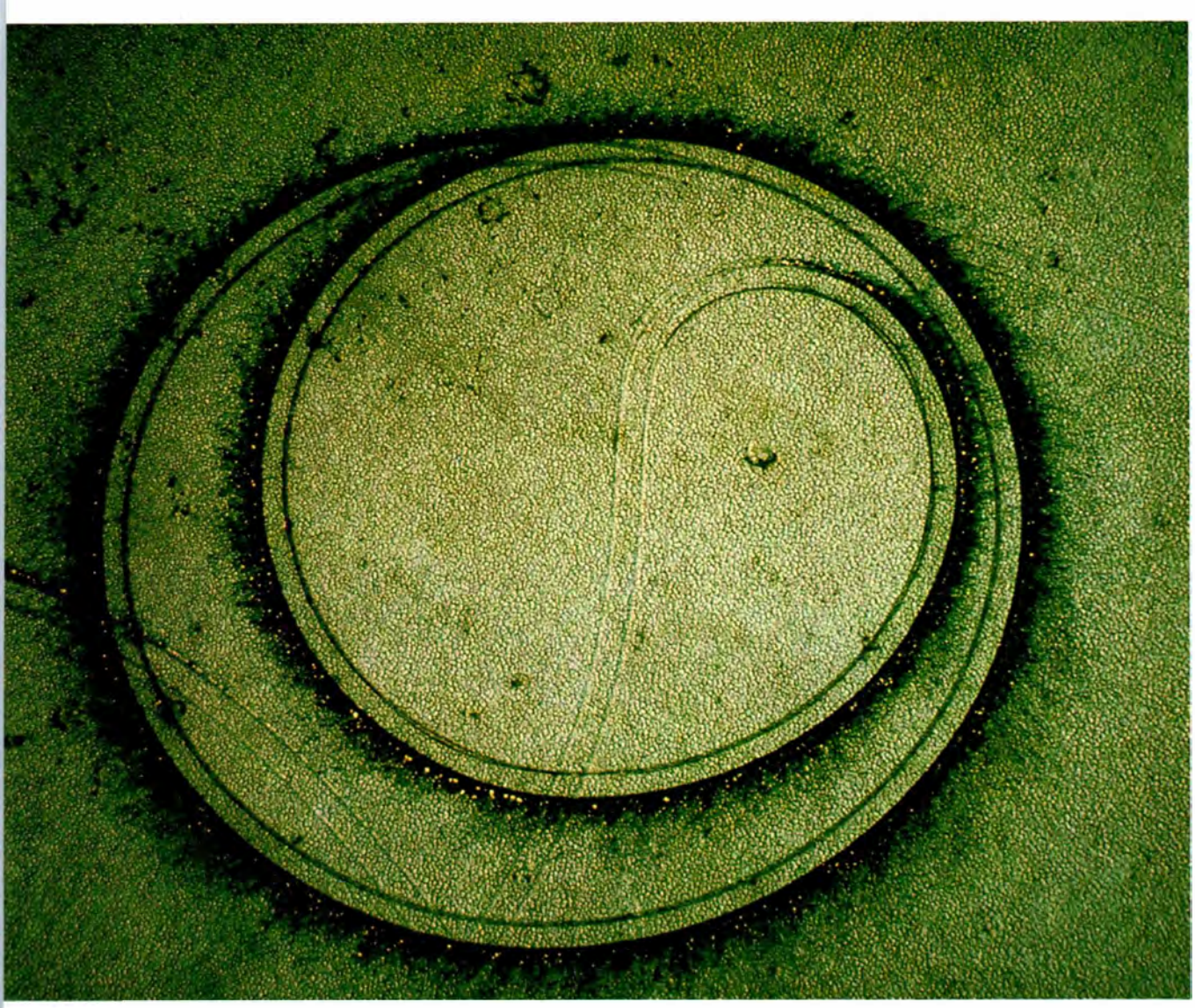
Beneath the aircraft, spread out like an endless textured tapestry, the changing scenes below provide an unlimited and amazing diversity of images to photograph.

PHOTOART

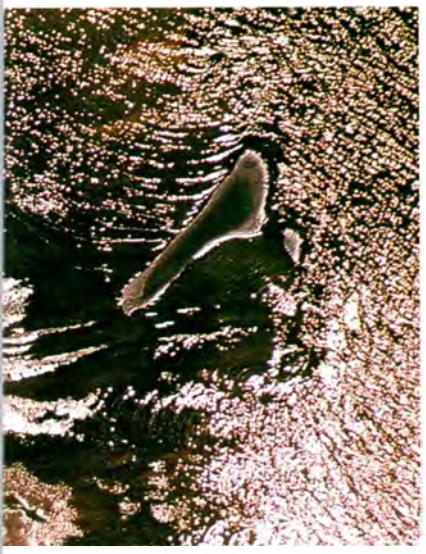
Flooded eucalypt forest west of the Grampians, Victoria.

P H O T O A R T

The shoreline of Corangamit Lake, Victoria



A driver's signature—vehicle tracks in a dry lake bed.



AERIAL ESCAPES

He felt a sharp pain – the platypus tooth had taken its first bite in 63 million years.

PATAGONIAN PLATYPUS

BY MICHAEL ARCHER

ANYONE LISTENING ON THAT UNforgettable night in June to the multilingual small talk coming from Argentinian Professor Rosendo Pascual's Sydney hotel room might have thought it a very relaxed international reunion. Everyone seemed so normal, so deceptively calm and collected. Yet, mere minutes after Rosendo's arrival, beads of sweat had begun to betray trembling fingers, because we all knew he had in his pocket a tiny black object of immense potential power. If its identity was confirmed, it would blast the hallowed textbooks and disintegrate cherished conviction that Australia was the sole parent of the Platypus—that national natural treasure we all naively assumed was as uniquely Australian as vegemite and lamingtons.

True, the *possibility* of finding a non-Australian monotreme (platypus, echidna or close relative) had long been accepted for mainly geological reasons. Until sometime between 38 and 45 million years ago, Australia had openly carried on an intimate biogeographic affair with South America, one albeit controlled by the intervening chaperone Antarctica. These future continents were the last vestiges of the once giant supercontinent Gondwana. Further, because we knew monotremes existed in at least the Australian portion of Gondwana as far back as 110 million years ago (see ANH Autumn 1986), there was no obvious reason why monotremes could not have existed in other areas of Gondwana.

The Patagonian platypus is known from a single tooth, held by Professor Rosendo Pascual.

But it is one thing to allow the *possibility* of monotremes rolling their rubbery little eggs through the muds of other continents. It is another thing entirely to have a South American colleague beam a puckish smile across unclenching fingers to reveal a very real, tangible tooth of a grossly un-Australian monotreme. The sight of this 'thing', which he and his students had found on the wind-swept slopes of a Patagonian hill, caused instant silence in the whole group—a moment of palaeogeographic reverence for a prehistoric treasure no-one really expected to see.

What resembled a weary wad of licorice bubblegum was actually the upper molar of a monotreme.

Reluctant to give up Australia's claim to monotremes, my eyes nevertheless confirmed Rosendo's conclusion that this thing was indeed a monotreme. What to the uninitiated might have looked like a weary wad of licorice bubblegum, unmistakably displayed for aficionados of teeth the characteristic wide and doubled V-shaped transverse blades and basal cusps found in nothing else in the world except the upper molars of monotremes.

But why, if our beloved flat-foots trampled Patagonia's paddocks before Australia was recognisably Australia, hadn't palaeontologists found South American monotremes before now? Rosendo explained that this tooth came from a newly discovered deposit that was older than most previously known mammal deposits in Argentina—61 to 63 million years, barely three million years after the last of the giant dinosaurs nose-dived into the muds of eternity. Knowledge of the kinds of creatures inhabiting South America at this time has therefore just started to accumulate. Furthermore, because of geological connections and barriers at that time, Patagonia may have had more in common with the Antarctic and Australian portions of Gondwana than it did with the rest of South America. For example, Patagonia and Australia once shared ceratodontid lungfish, Australia's living Lungfish being the only survivor of this once-widespread group.

We asked Rosendo to recount the events of the discovery, wanting to learn every detail of this momentous find. Rosendo dropped his head and smiled in recollection. One of his students had sat down on the fossil deposit for a rest and felt a sharp pain in his rear end—the tooth having taken its first bite of something edible in 63 million years. Plucking the fossil from his savaged posterior, he had passed it to Rosendo for comment. For a moment Rosendo puzzled over the unfamiliar thing, then dryly asked the student if he was absolutely certain he hadn't 'produced' it himself!

Back in the Museum in La Plata, they tried in vain to match the tooth's weird shape with that of any other group of mammals previously known from South America. Zero. They then ran it alongside the choppers of creatures known from North America and Europe. Still zero. Finally one of his students joked "Maybe it's a monotreme!" Rosendo laughed...but as memories were triggered the laughter suddenly trailed off. He raced for his files on extinct Australian mammals and, an instant later, pulled out a 1975 paper by Mike Woodburne and Dick Tedford describing two isolated teeth, which they perceptively concluded came from an extinct platypus-like monotreme. They named it *Obdurodon insignis*, meaning 'lasting tooth of significance' in reference to the fact that this platypus-like beast had functional teeth unlike the living Platypus whose teeth drop out when it is still a chubby little youngster.

Comparing his tooth with those pictured of the extinct *Obdurodon insignis*, Rosendo noted many similarities – but also many differences. Because Woodburne and Tedford had guessed incorrectly (as we later discovered following discoveries of more complete *Obdurodon* material from Riversleigh; see ANH Summer 1990–91) that the two Australian

PIP SMITH / AUSTRALIAN GEOGRAPHIC

teeth were upper molars. Rosendo was misled into concluding that there were significant differences between his tooth, an undoubted upper molar, and the teeth of the Australian animal, which were in fact lower molars. But spurious differences or no, there was an overall basic similarity that left no doubt in his mind that this was the first non-Australian monotreme—and he was very excited!

His exuberance overflowed in a letter of early 1991 to Mike Augee and me at the University of New South Wales. He offered to announce the discovery at the Royal Zoological Society of New South Wales' Monotreme Symposium being organised by Mike. After gawking at a photograph of the tooth Rosendo had sent with his letter, we dove into a frenzy of fund-raising to ensure his transport—with the *thing*—to Australia. The Royal Zoological Society of New South Wales, the Riversleigh Society and the University of New South Wales tipped out their pockets guaranteeing a high-profile scientific forum for this venerable Patagonian debutant and her Argentinian godfather.

When Rosendo arrived accompanied by his charming wife Nellie he was still convinced he had in his pocket a monotreme quite unlike any previously known from Australia. But that brief glance in his hotel room told me the differences were amazingly few. The next day, when we lined up his tooth beside the tooth of an undoubted upper molar of *Obdurodon* from a 15-million-year-old Riversleigh deposit, he gasped *"Mon Dieu!"* What he saw was most certainly not what he expected. All of the key features he previously thought distinguished the Patagonian animal were there in the Riversleigh platypus—despite a separation by continents and more than 40 million years.

Although in the end we concluded that there were enough differences to confidently separate the Patagonian form from the Australian beasts and named the Patagonian platypus *Monotrematum sudamericanum*, it is clearly very similar to species of *Obdurodon*. Add to this the fact that the lower molars of the early Cretaceous Lightning Ridge monotreme *(Steropodon galmani)* are also very similar to those of *Obdurodon* and we have one of the most remarkable cases of long-term constancy of general tooth form known among mammals—a period in excess of 110 million years. Whatever these early monotremes munched with their distinctive molars, it seems that they did it for a very long time despite worlds literally crumbling beneath their feet.

The discovery of the Patagonian platypus is one of the most exciting palaeontological events of the century. But just as certainly it will prove to be the first of many equally exciting discoveries waiting to be made in that tantalising deposit. Could our beloved koalas, bandicoots or even kangaroos have representatives there? Were archaic 'thingodontans' or 'bizarrodontans', creatures unique to Australia that survived long enough to leave fossils at Riversleigh, inhabitants of that same patch of Patagonia? As our Argentinian colleague has so often been heard to say, 'for sure, maybe'.

There is, of course, only one certain way to find out. Rosendo, squirming in the same fires of curiosity as us, has generously invited us to join him in the follow-up University of La Plata Expedition to Patagonia in late 1992. All that stops us is the need to find sufficient support for the Australian part of the team. The Australian Geographic Society has made a substantial contribution towards the costs but, with time rapidly running out, we still have a long way to go—$20,500 is still needed. Is there out there an angel of mercy sufficiently curious about Australia's past to help Australians explore this extraordinary aspect of Australian prehistory? ■

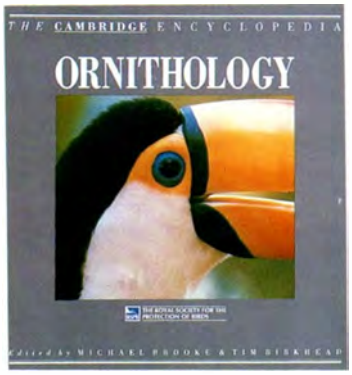
Professor Michael Archer lectures in biology and geology at the University of New South Wales. Most of his non-teaching hours are devoted to the study of the fossil faunas of Riversleigh.

A PLEA FOR HELP

Anyone who can help the 'Reunite Gondwana' Patagonian expedition is urged to make tax-deductible donations to the Vertebrate Palaeontology Research Fund, School of Biological Science, University of NSW, PO Box 1, Kensington NSW 2033.

REVIEWS

COMPILED BY
JENNIFER SAUNDERS



The Cambridge Encyclopedia of Ornithology*

Ed. by Michael Brooke & Tim Birkhead. Cambridge University Press, Cambridge, 1991, 362pp. $65.00.

The study of birds is a constantly expanding science. The many ornithologists worldwide engaged in advancing our knowledge of birds do so at a rate that annually fills many scientific publications. Distilling this vast body of information down into an easily digestible and accessible overview of ornithology, and at the same time maintaining a feel for the currency of findings on a diverse range of fronts, is an exacting endeavour. There are already general ornithological texts of quality on the market, some recent, some of long standing, as well as some classics now out of print and outdated. *The Cambridge encyclopedia of ornithology* is an attractive newcomer to this company.

In contrast to the single or dual authorship that characterise most of the existing texts, an impressive selection of 39 contributors has been assembled for the compilation of the encyclopedia, many of whom are at the forefront of their subjects. The coverage of ornithological topics is comprehensive. The 11 chapters deal with all the major subjects a reader would expect: external morphology, anatomy and physiology, evolution, classification, distribution, populations, breeding, flight, migration and navigation, and behaviour.

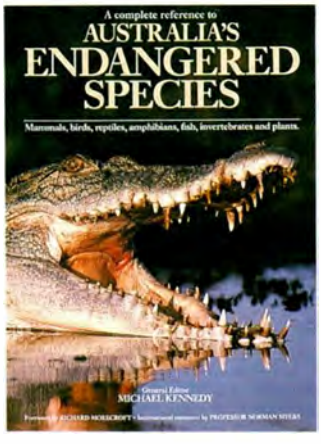
The final chapter, "People and Birds", explores the many facets of our relationship with these animals. Starting with the history of human interest in birds, it reviews the use of birds in art, literature and music; domestication; the impact of birds on people; the exploitation by people of birds; and finishes with a lengthy section on conservation. This is a valuable conclusion to the book, particularly as it is as current as any other general text on the constantly varying nature of the topic.

The volume is attractively produced, and compares very favourably with other ornithological reference books in terms of its illustrations. Most are attractively executed and serve well to support the point being made (a few, however, are quite inadequate). Unlike almost all of its competitors, the Cambridge volume has copious colour illustrations. This certainly adds to the overall attractiveness, but in only a few instances does it seem to make a substantial difference to the subject being illustrated.

Overall, *The Cambridge encyclopedia of ornithology* is a worthy and high-quality publication, and compares well with other texts on the market. One advantage it offers to the Australian reader is its greater availability in this country, along with a more competitive price than most.

Because of the depth of its subject matter, *The Cambridge encyclopedia of ornithology* will better suit a reader with a developed interest in ornithology than one needing just an introduction to birds. However, anyone beyond the introductory stage will find it a useful and attractive acquisition.

—Walter Boles
Australian Museum



Australia's Endangered Species*

Ed. by Michael Kennedy. Simon & Schuster, Sydney, 1990, 192pp. $39.95.

Of the dozens of recent books published on endangered species in Australia and overseas, almost all have been confined to birds and mammals with only the occasional mention of the other vertebrates. *Australia's endangered species* stands out because it clearly considers the invertebrates and plants as well. Biologists, as opposed to some lay conservationists, know that for the well-being of fauna, flora and humanity the conservation of invertebrates such as earthworms is far more important than that of vertebrates such as the Panda or the Koala. Unfortunately for the invertebrates, none is as cute as the Panda or as cuddly as the Koala. The knowledge of invertebrates among leading conservation organisations appears to be shaky. The Worldwatch Institute, for example, did not realise nematodes, eelworms and roundworms are one and the same, and therefore their estimate of the world's species is too large by two million.

Conservationists, including the editor Michael Kennedy, argue that "all species on this planet maintain an inalienable right to existence", and that other reasons for conservation (maintenance of a genetic bank, the pleasure given by organisms and the environmental services they provide and so on) are subsidiary. But why do all species have an inalienable right to live? Because they were created in some Garden of Eden or because they are the end points of evolution? Perhaps philosophers can tell but they will not convince me that *Plasmodium falciparum* has an inalienable right to attack and kill human beings to survive, and that it was immoral for the World Health Organisation to try to eradicate malaria. Has the Koala, which conservationists try to preserve, a greater inalienable right to survive than the *Chlamydia* that attacks it?

Conservation of invertebrates such as earthworms is far more important than that of vertebrates.

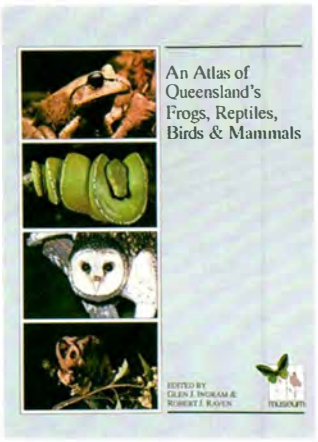
Politicians, who dole out the money for conservation and who say yea or nay to the exploitation of biologically important areas, may well dismiss the inalienable-right argument as mere sentimentality, so it is politic for the conservationists to push the other arguments. They are, after all, convincing enough.

Fortunately, the authors of this book do not dismiss the less emotive organisms so readily. Geoff Williams, for example, stresses the role of invertebrates in ecosystems, which would soon be out of kilter without them. And John Benson reminds us that there is a host of new genes

and new drugs out there that could be more valuable in hard cash than felled trees.

Australia has a poor record. We are losing species at a greater rate than other areas of the same size—although perhaps it is worth pointing out that we probably never eradicated an animal as numerous as the American Bison or Passenger Pigeon. We have lost our animals and plants through habitat destruction and the impact of introduced animals and weeds, not through Buffalo Bills. Our problems are indeed great, and this excellent book, with its careful catalogue of endangered and vulnerable species and sound biology, will provide us with a good tool in our attempts to save *all* of Australia's endangered species.

—Arthur Woods
University of NSW



An Atlas of Queensland's Frogs, Reptiles, Birds & Mammals*

Ed. by G.J. Ingram & R.J. Raven, Queensland Museum, Qld, 1991, 391pp. $45.95.

This is a book of maps—pages and pages of them—1,259 in all. It may look like a dull read, but I found it engrossing, and commend this book very highly.

Distribution maps are a cornerstone of biology. In guidebooks and taxonomic revisions they complement text and illustrations to conjure up a three-dimensional portrait of a species. A good distribution map is worth 1,000 words or more. It can point to climatic, habitat and historical constraints on a species' existence.

The distribution maps in this book were generated from the Queensland Museum's computer database and correspond with specimens held by the Museum dating back to the 1860s. For reptiles and frogs they provide a most up-to-date record of distribution, but for mammals and birds they are less comprehensive and their interest is sometimes historical.

Some of the maps tell sad stories. I had not realised that the extinct Paradise Parrot once graced the forests of Brisbane, nor that Northern Quolls previously prowled within 100 kilometres of that city. This quoll is now restricted to northern Queensland where it continues to decline. Equally surprising is an old record of a Bilby from near Roma on the Darling Downs. Bilbies are now confined to the Channel Country of far western Queensland.

Some of the maps tell of new discoveries. Notable among these is the addition to Queensland's fauna of several new bats and three possums—the Mahogany Glider, Daintree River Ringtail and Rock Ringtail. Fifty-one new reptiles have been described since 1980, and almost 40 per cent of Queensland's frog fauna was discovered after 1970. Also significant are dramatic range extensions, such as the finding of Tiger Snakes in central Queensland and Ringed Brown Snakes along the east coast.

Fascinating but brief introductory chapters describe the holdings of the Museum (16,000 frogs, 24,000 reptiles, 12,000 birds, 2,000 bird eggs and 16,500 mammals), and other chapters discuss endangered species and provide a checklist of the groups, along with maps of collecting localities and biodiversity.

This is a very intelligently produced book, and a great tribute to computer technology as a biological tool. My one criticism is that no common names accompany the maps—a reasonable omission for reptiles and frogs, but not for mammals and birds, whose common names are standardised and common currency among naturalists and biologists.

—Tim Low

The Young Naturalist Series* Cities and Towns; Forests, Woodlands and Heaths; The Deserts; Exploring Lakes, Rivers and Creeks

By Courtenay Smithers; Harry F. Recher; Penny van Oosterzee & Stephen R. Morton; Noel Tait & Robyn Stutchbury. Reed Books, NSW, 1991, 79pp. and $12.95 each.

In the green years of my youth, non-academic books on native fauna and flora were scarce, and each find was a treasure beyond price to this budding naturalist. Those first natural history books still sit proudly on my library shelves. Among the authors, it was Australian Museum entomologist Keith McKeown, writing simply and with enthusiasm about insects and spiders in the 1930s and 1940s, who did much to set me on my own chosen path.

Today, the nature section of many general bookshops overflow with tempting titles in technicolour dust-jackets, but not all deliver what they promise. Wise choices need to be made, especially by grown-ups buying for intelligent but perhaps less discerning young relatives.

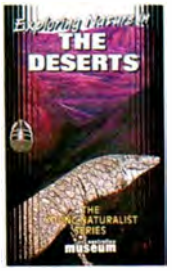
No better choice could be made than the four books in the Young Naturalist Series published by Reed Books in association with the Australian Museum. As the titles suggest, each book covers a major environment with its associated plants and animals. Each is written by a scientist eminent in his field, giving authority to the lucid explanations of ecological concepts, fundamental biological relationships and conservation concerns. The books, although far from superficial, are simply written and a delight to read, full of fascinating facts about plants and animals, their environment and interactions.

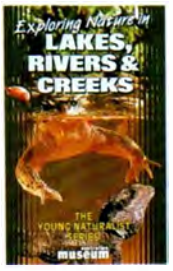
> These books should set many eager feet along their own paths of exploration.

Design can make or mar a book, and I personally find the layout of text and illustrations in these four adds a great deal to their attractiveness. The text is in manageable sections. The photographs, often several to a page, are of different sizes and attractively linked to avoid boring uniformity.

The photographs range from adequate to excellent. I hesitate to pick favourites, or make comparisons, but find most notable Mike Gillam's environment shots in *The deserts* and Kathie Atkinson's aquatic invertebrates in *Lakes, rivers and creeks*. In all, but especially the latter book, attractive line drawings and diagrams provide information not easily gained from photographs alone.

In the face of such overall excellence I am hesitant to make such minor criticisms as the following: in the section on recycling in *Forests, woodlands and heaths* it was surprising to see termites twice referred to as 'white ants'. I thought white ants had long ago been recycled into their proper taxonomic sisterhood. Also, as a champion of invertebrates I have



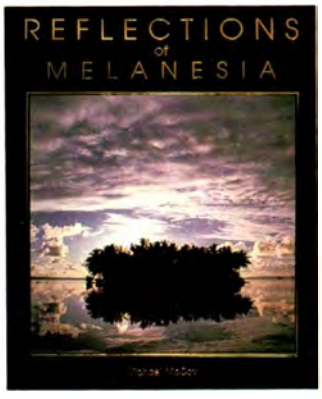


reservations about killing and collecting them, as suggested in *Cities and towns*. We don't encourage children to pop lizards or frogs into methylated spirits, so why insects and spiders? Living insect pets are more fun and certainly more educational. The garden slug *(Limax)* caption in *Cities and towns* is wrong; *Limax* does not feed on snails, it is a scavenger. Several photographs are printed upside down. And finally, why do publishers persist in spreading pictures and diagrams across two pages, losing information in the central gutter? I feel some of the illustrations could have been better adjusted to the tall format of these books.

Those small things aside, in all important ways the books are truly excellent value and should set many eager young feet along their own paths of exploration. A love of nature is innate and requires no teaching, but an understanding of nature needs a helping hand as we build on the knowledge of others. There could be no better foundation for building than these four books.

Although I wish they'd been around when I was young, I am not too old and certainly not too knowledgeable to have enjoyed reading every word for this review. I recommend that you buy them for someone you love. Why not yourself?

—Densey Clyne
Mantis Wildlife Films, NSW



Reflections of Melanesia

By Michael McCoy. Crawford House Press, NSW. 1990, 159pp. $39.95.

Mike McCoy is a Sydney-born photographer whose images of various aspects of Melanesian natural history and social life have been published widely. *Reflections of Melanesia*, his third book, is a collection of photographs of the landscapes, fauna and peoples of Papua New Guinea and the Solomon Islands. The breadth of material presented is quite extraordinary, demonstrating McCoy's skill and versatility as a photographer. From the air, he offers seldom seen views of islands, rivers, deltas and coasts; from the forests and plains, incisive images of insects, plants, mammals, reptiles and birds; and under water, the intriguing realm of corals, nudibranchs and fish.

The photographs, many of which are of quite astonishing clarity and beauty, are accompanied by an informative introductory text, brief identifying captions and more detailed commentary at the end. McCoy is an informed observer and, apart from the obvious aesthetic appeal of images, the book establishes itself strongly as documentary work. Among the many scientifically valuable photographs is the shy and elusive Grey Dorcopsis, the rare Solomon Islands Giant Tree Rat and, my favourite, a Mourning Gecko falling prey to a huntsman spider.

A quarter of the photographs in *Reflections of Melanesia* are of people, and most regions in Papua New Guinea and the Solomon Islands are represented. For the most part, the book avoids the insentient, emblematic portrayal of Melanesian peoples so characteristic of such books as Malcolm Kirk's *Man as art* (1987).

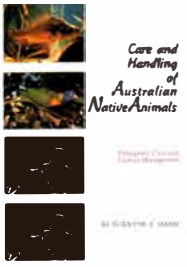
McCoy is an informed observer and the book establishes itself strongly as a documentary work.

McCoy's portraits of men, women and children engaged in both the drama of ritual and the minutiae of daily life are seldom intrusive and often compelling. There is a warmth of intimacy in many of the images, most particularly in those from the Solomons, where McCoy has lived since 1969. By subtle contrast, a certain distance is discernible in the New Guinea photographs which, to the careful eye, is not present in the other images.

This leads to the only criticism of *Reflections of Melanesia*. In his commentary, McCoy has taken considerable care to record not only the precise localities of his photographs, but also the exact date on which each was taken. Yet the names of the individuals who appear in his portraits are entirely absent. This is a regrettable omission, which somewhat undermines McCoy's argument for the value of documentary photography in recording cultures undergoing rapid social change in the wake of European impingement. More importantly, it effectively removes an avenue of recognition for the photographed individuals and their descendants in the future. This is a significant lapse, but a relatively small flaw in an otherwise excellent book.

Most people with a particular interest in other worlds and other cultures can name a book from their childhood that fired their imagination and offered rich material for thought and enduring fascination. The added value of *Reflections of Melanesia* is that it is just such a book. Those familiar with Melanesia through field research, wartime service, reading or travelling for pleasure will be rewarded with a new perspective. For those for whom the Solomon Islands and Papua New Guinea are remote and enigmatic locations, McCoy's book is a fascinating and informative window on two of Australia's closest Pacific neighbours.

—Alexandra Szalay
Australian Museum



The Care and Handling of Australian Native Animals*

Ed. by Suzanne Hand. Surrey Beatty & Sons, NSW. 1990, 210pp. $30.00.

This book is one of a few dealing with emergency care and captive management of native fauna, but it is the only one I have looked at in any detail. It is the result of a symposium held by the Royal Zoological Society of New South Wales organised by Michael Archer and Marianne Cochrane in September 1986. The chapters largely represent the material presented at the symposium, with one or two subsequent updates and additions.

As can be expected from this, there are 14 authors covering 20 chapter topics and the style and amount of information varies. Some chapters cover only one species in great detail, (for example, "Koalas" and "Grey-headed Flying-foxes"), while others are far broader (for example, "Bird handling" and "Diseases and parasites").

Most chapters are illustrated with black-and-white photos, colour photos and illustrations. The papers presented at the symposium obviously had a slight bias towards mammals as a breakdown of the subject matter runs as follows: 12 chapters on mammals, three on general topics, two on birds, and one chapter each on reptiles, fish and frogs.

This is not meant as a criticism of the book, as most material is adequately covered. It seems more a case of mammals being the ones more frequently kept and often casualties of human activities. Different types of mammals require such specialised care that a 'one chapter covers all' approach would not suffice. The only obvious shortcoming in lack of information was in bird care. Birds would surely be as regularly encountered a casualty as mammals and frequently kept in captivity, so a greater detail on dietary requirements, husbandry and tips on getting them to feed would have been very useful.

Unfortunately, I did notice a few mistakes, and one or two were impressive. For example, plate 4A indicates how to hold a large waterfowl and labels the bird

used in the demonstration as a Mute Swan. It is quite clearly a white barnyard duck!

Each chapter tries to cover all the aspects that will be of use in treating and caring for the animals concerned. Where possible, details of medications, milk formulae and dietary supplements are included. The preface also carries the timely warning that most native fauna is protected and "this volume is not intended to encourage the unauthorised keeping of Australian native animals. Where possible, details of medications, milk formulae and dietary supplements are included. The preface also carries the timely warning that most native fauna is protected and "this volume is not intended to encourage the unauthorised keeping of Australian native animals...and infringements incur stiff penalties". To assist in information on these legal considerations a list of appropriate wildlife authorities for each State is provided.

All in all, I think this book would be a useful addition to anyone who works with, or cares about, our native fauna.

—Martyn Robinson
Australian Museum

State of the World*

By Lester R. Brown. Allen & Unwin, NSW, 1991, 254pp. $19.95.

The Worldwatch Institutes State of the World Series, published annually since 1984, has served as a useful vehicle to focus attention on the really big environmental issues. The series runs into a problem, however, as the situation of these issues does not change much year to year. For an annual publication, it becomes boring to report on the extra 100 million people, declining forests, and small changes in temperature that occur over a year. Therefore, the series has diversified into some of the side issues and moral questions.

The book begins with a strong chapter entitled "The New World Order" by Lester Brown. It covers the paramount areas of food production, population, forestry resources, political change and much more. It is vital and compelling reading for those who would like a world overview of the biological crisis. Many of the following chapters, however, lack the punch of Brown's opening. These cover topics of energy, recycling, urban transport, forestry, eastern Europe, abortion (surprisingly), the military and the environment, patterns of consumption, and the global economy.

The most interesting and laudable of these chapters for me is the one on abortion. It establishes the importance of abortion as a birth control method (with around 50 million being performed each year) and furnishes information on abortion laws worldwide. It will make fascinating, indeed essential, reading for the largely North American market of this book.

—Tim Flannery
Australian Museum

Just Published

July

The Australian Guide to Whale Watching
By Tina Dalton and Ross Isaacs. Weldon Publishing, NSW. $14.95.

Nature of Australia
By John van der Beld, Allen & Unwin, NSW. $39.95.

August

The Proteaceae of the Sydney Region
By Alec M. Blombery and Betty Maloney. Kangaroo Press, NSW. $49.95.

Pest Animals in Australia: A Survey of Introduced Wild Animals
By George Wilson, Nick Dexter, Peter O'Brien and Mary Bomford. Kangaroo Press, NSW. $16.95.

Gone Bush (compact disc)
By Les Gilbert. Produced and distributed by Natural Symphonies, NSW. $27.95.

September

Greening a Brown Land: The Australian Search for Sustainable Land Use
By Neil Barr and John Cary. Macmillan Australia, Vic. $32.95 paperback, $64.95 bound.

October

The Greening of the Hill: Revegetation Around Broken Hill in the 1930s
By H. Webber. Hyland House Publishing, Vic. $29.95.

Dinotopia
By James Gurney. Crawford House Press, NSW. $29.95.

Bivalves of Australia Volume 1
By Kevin Lamprell and Thora Whitehead. Crawford House Press, NSW. $49.95.

Collins Eyewitness Guides
Sharks by Miranda MacQuitty.
Volcano by Susanna van Rose.
Collins, Angus & Robertson, NSW. $19.95 each.

Collins Eyewitness Handbooks
Shells by S. Peter Dance. Australian Seashores by W. J. Dakin, revised by Isobel Bennett. Collins, Angus & Robertson, NSW. $29.95 each.

Elephants
By Jeheskel Shoshani. Reader's Digest, NSW. $52.00.

February

The Complete Diver's and Fishermen's Guide to Coastal Fishes of South-Eastern Australia
By Rudie H. Kuiter. Crawford House Press, NSW. $29.95

All books marked* are available from the Australian Museum Shop, which operates a full mailing service — call (02) 339 8150.

I spotted a cuscus in a palm tree and was able to climb to within a couple of metres of its small frightened face.

CAPE YORK

BY TIM LOW

MOST AUSTRALIANS THINK that Cape York is that huge column of land marching north from Cooktown. Even in reputable wildlife books one reads about the Cape York rainforests, home to cassowaries and cuscuses. This is all nonsense.

Cape York is no more than a barren rocky headland, carrying little vegetation and even less wildlife. It is the lump of rock constituting the northernmost tip of mainland Queensland, and it is from this that the much larger Cape York Peninsula takes its name.

Because it's the very top of Oz, Cape York has long been a point of pilgrimage for four-wheel drivers. Although the road up from Laura includes some rough river crossings, providing a small dose of adventure, many dusty pilgrims are disappointed by the scenery on the way—mainly flat eucalypt woodland.

The more satisfied pilgrims are probably those who fly up for the birds. The monsoon rainforests behind the Cape are a birdwatcher's mecca, and in the wet season the twitchers come with lists and pens to tick off the 'Cape York endemics'—a group of about 18 birds found in Australia only on Cape York Peninsula. Others come with a more general curiosity and are delighted by sightings of quolls, crocodiles and pythons. The forest below Cape York is one of those special places where nature still holds sway.

Most of the wildlife lurks in Lockerbie Scrub, a large block of monsoon rainforest a few kilometres south of the Cape. The dry season here is very harsh, and only the hardier rainforest species do well. Many rainforest trees shed their leaves after the wet. Plant and animal diversity is much lower than in the wetter rainforests further south, in Iron Range, McIlwraith Range, the Daintree area and Atherton Tableland. In these regions mountains capture a regular rainfall, and the mountain slopes have served as wet refuges during dry times, preserving a diverse fauna and flora.

Nonetheless, the Lockerbie Scrub features spectacular plants. The showy Cape York Lily (*Curcuma australasica*) sprouts a spike of yellow flowers each framed by a pink bract. Rainwater trickles into the bracts and the seeds develop under water, presumably to deter seed-sucking bugs. This line of defence does not stop one kind of bug, which marches under water to attack the developing seeds.

Other unusual plants are the ant plants (*Myrmecodia tuberosa* and *Hydnophytum papuanum*), odd-looking epiphytes of the rainforest canopy and nearby tea-tree woodlands. Their stems at the base are very swollen and riddled with tunnels, providing a ready nest site for small ants. In return for free rent, the ants provide nutrients and protection for the plants.

Lockerbie Scrub does not harbour a large mammal fauna. The drawcards for the naturalist are the Spotted Cuscus (*Phalanger maculatus*) and Striped Possum (*Dactylopsila trivirgata*), although both are secretive and difficult to find. Slow-moving cuscuses sometimes venture forth by day, so it is worth scanning the trees for grey balls of fur. I spotted one in a palm tree and was able to climb to within a couple of metres of its small frightened face. Another time I saw a cuscus late in the morning munching leaves in open forest near a rainforest gully. After clambering into the upper branches of a eucalypt, it curled into a ball and fell asleep, looking just like a small Koala.

Cuscuses and Striped Possums are both possums, but they present an amazing contrast. Cuscuses, slowest of the possums, seem sedated; Striped Possums act like they are high on amphetamines. Never still, they scamper and frolic and fly through the branches. When pausing to feed, the extravagantly furry tail twitches and curls with a life of its own. You don't look for Striped Possums, you listen for them. If not crashing through the branches they are noisily

OWEN FOLEY

tearing back bark after insects. Boldly striped in black and white they are extraordinarily beautiful – my favourite possum.

While searching for possums at night you are likely to hear the doleful call of the Marbled Frogmouth (*Podargus ocellatus*). Although it scarcely looks any different from the very common Tawny Frogmouth (*P. strigoides*), the Marbled Frogmouth draws birdwatchers to Cape York from all around Australia because it is one of the 'Cape York endemics'. Strictly speaking the term 'endemic' is incorrect because they are all, apart from the White-streaked Honeyeater (*Trichodere cockerelli*), predominantly New Guinea birds with outlying populations in Australia's far north. You must travel north of Cooktown to be assured of seeing any of them. All but four can be seen at Lockerbie Scrub or in adjacent open forest. The Palm Cockatoo (*Probosciger aterrimus*), Australia's largest parrot, is probably the most famous of the 'endemics' and rightly so, for it is an imposing bird, with an enormous hooked bill. It often feeds in open forest where it is easily seen. The jewel of the 'endemics' is perhaps the Red-bellied Pitta (*Pitta erythogaster*). When one of these quail-like birds skips across your path, flaunting dazzling red belly, blue breast and iridescent green back, it is difficult not to gasp. The sight is a very special one, for these birds come to Australia only for the wet season (summer, autumn), spending the rest of the year in New Guinea.

Looking south to mainland Australia, Cape York appears as a rocky finger of land.

FRITHFOTO / ANT PHOTO LIBRARY

The Palm Cockatoo is our largest parrot.

A very difficult 'endemic' to tick off is the Yellow-legged Flycatcher (*Microeca griseoceps*), a tiny dull bird of the rainforest limbs and canopy. Fortunately there is an easy way. The Cape York Wilderness Lodge, situated just behind the Cape, has a bird tower bolted to a tall rainforest tree. If you sit and wait (or play a tape-recording of the calls) you can see flycatchers, Frilled Monarchs (*Arses telescophthalmus*) and Yellow-billed Kingfishers (*Syma torotoro*), to name a few. Magnificent Riflebirds (*Ptiloris magnificus*) display near by, and Buff-breasted Paradise-kingfishers (*Tanysiptera sylvia*) often streak by.

The Cape York Wilderness Lodge is the ideal place to stay during a visit to the Cape. Apart from its comfortable semi-detached units there is a dry-season camp-ground. Canvas accommodation is also available a few kilometres away at Punsand Bay.

The lodge is surrounded by open forest and rainforest, and spectacular wildlife can be seen from the open-plan dining area. Northern Quolls (*Dasyurus hallucatus*) scamper around the swimming pool and Northern Brown Bandicoots (*Isodon macrourus*) vie for scraps, taking care not to venture too close to the large Amethystine Pythons (*Morelia amethistina*), which lurk in the shrubbery (see ANH Winter 1989). Although bandicoots sometimes fall into the swimming pool, it is a safer alternative to the sea, which harbours marine stingers, sharks and the occasional crocodile. From the lodge it is only a ten-minute walk to the top of Australia, although the view is somewhat interrupted by the small islands offshore.

To see wildlife, and birds in particular, you should visit the Cape during the wet season, preferably January to March. With the onset of the dry season many birds fly to New Guinea, and others become secretive. The road to the Cape is closed at this time, but you can fly to the nearby Aboriginal and islander settlement of Bamaga. This community recently bought the lodge, so it is likely that future visitors will be treated to displays of local culture. Alternatively, a three-day boat trip from Cairns allows you to take in the sights on the way and gives you a very different look at Australia's northern coastline. ■

Tim Low is a nature writer and environmental consultant. He worked for two months as a naturalist at the Cape York Wilderness Lodge.

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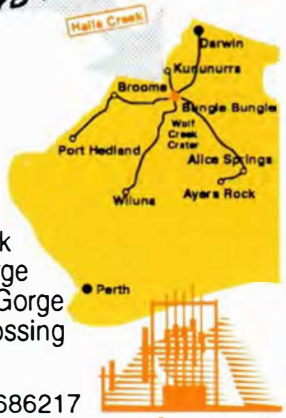

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QUESTIONS & ANSWERS

COMPILED BY JENNIFER SAUNDERS

Huddle or Die

Q. ***When Emperor Penguins in the Antarctic huddle together to survive the excessive cold and high winds, do those poor individuals stuck on the outside die from exposure?***

—E. Gaulstin
Balgowlah, NSW

A. No. This is because an Emperor Penguin huddle is not static—each bird takes a turn occupying both the warmest and coldest positions of the huddle.

As coldest position of the huddle is on the windward side, the birds constantly peel off one-by-one from the group and shuffle, with their egg, down the flanks of the huddle to rejoin the group on the leeward side. Here, they are soon absorbed into the mass as more and more birds follow suit and pack in around them. In this way, all the birds pass through the warm centre of the huddle, eventually returning to the windward side only to start the process all over again. As a result of this constant circulation of birds, a huddle gradually moves downwind.

Huddling is an important survival mechanism for Emperor Penguins as it can cut the bird's heat loss by as much as 50 per cent and thus enables the males to survive the long winter fast as they incubate their eggs.

—J.S.

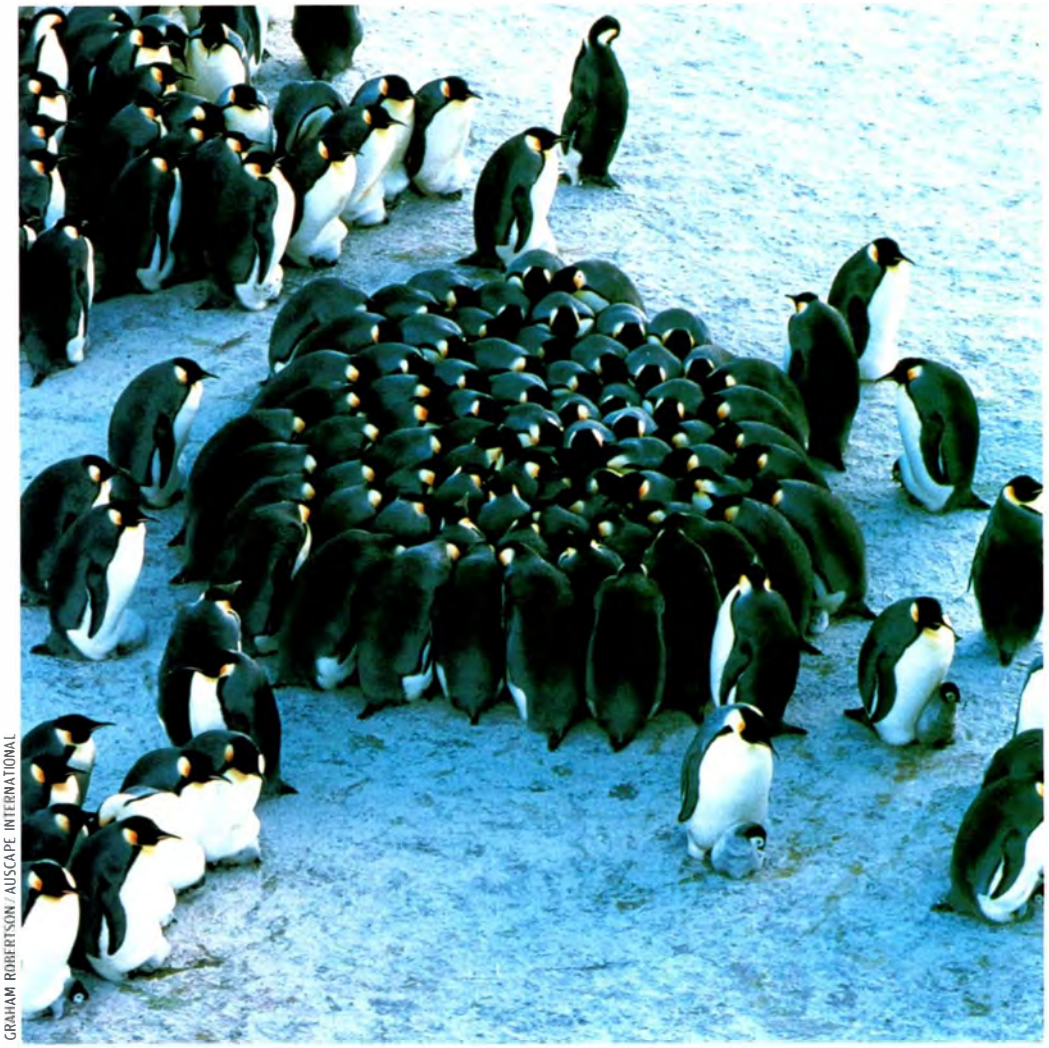
Sizeable Feast

Q. ***Smaller hunting spiders are a delight to watch and are encouraged to cohabit with us. The commonest one is a glossy black spider with creamy or yellowish markings. Recently, we witnessed what appeared to be an egg-distended female of this species preparing to feed upon a much larger huntsman spider. Is cannibalism amongst spiders common, especially when the size difference between predator and prey is so great?***

—Nick Romanowski
Forrest, Vic.

A. Your predator is the jumping spider *Breda jovialis*. This common jumper is not known to regularly feed on much larger prey, like a huntsman, but clearly they do so occasionally. This applies to many spiders, and behaviour and the use of silk often helps. Trapdoor and funnel-web spiders, for example, ambush frogs and lizards in their sticky 'spring-loaded' webs. Net-casting spiders snare large crickets in their stamp-sized nets, and large orb weavers occasionally trap small birds (and then wonder what to do with them—usually cutting them out of the web before too much damage occurs, and only rarely feeding on them).

As far as cannibalism is concerned, this often happens in the spider world. Spiderlings disperse to get away from mum and their siblings who might eat each other if they stay together too long. Spiders like the White-tailed Spider prey almost entirely on other



GRAHAM ROBERTSON / AUSCAPE INTERNATIONAL

Emperor Penguins huddle to survive the cold Antarctic winters.

spiders, as does *Portia*, a tropical jumping spider, while two entire families, the assassin spiders (Mimetidae) and the long-jawed spiders (Archeidae), do nothing else but eat other spiders. In these cases, predator and prey are usually about the same size. This, however, is not the case for *Argyrodes incursus*, a small spider that preys exclusively on its much larger cousin, the Platform Spider *(Achaeranea mundula)*. The small assassin is suitably garbed in undertaker black with a red flash. Not content with eating its 'host', the spider takes over its web and makes its egg sac inside the host's leaf retreat.

—Mike Gray
Australian Museum

Small Talk

Q: ***Why are pygmies small?***

—J. Derwent
Oatley, NSW

A: Despite an interest in this question for over 4,000 years, scientists still don't know for sure just why some races are small. A recent study by Robert Bailey from the University of California, Los Angeles, in the USA has suggested it is the result of genetic factors rather than physiological ones (an initial detailed study seemed to indicate that pygmies were of normal size until puberty, where they failed to undergo the adolescent growth spurt characteristic of other humans). If it is genetic, then the next step is to identify what ultimate selective factors have caused it. This is where scientists run into problems, as one factor alone cannot account for all the different pygmy populations that exist. Current factors under consideration include heat control (hot, humid climates favour small body size), ease of movement through dense vegetation (efficient movement through dense forest favours small body size), and low and fluctuating productivity (small people are better able to endure starvation under such conditions). Bailey's studies seem to indicate that in order to answer questions like this one, we need to go beyond focusing solely on pygmy size and look at the whole issue of just what determines human body size.

—J.S.

FRANCOIS GOHIER / AUSCAPE INTERNATIONAL

The three-toed sloth is able to double its speed when threatened by a predator.

Slow but Dangerous

Q: ***One of the Guiness Book of Records lists the three-toed sloths as the slowest mammals in the world but a footnote indicated they could double this speed "in an urgent situation". What would constitute such urgency for these beasts and would this extra speed really help if they are so slow?***

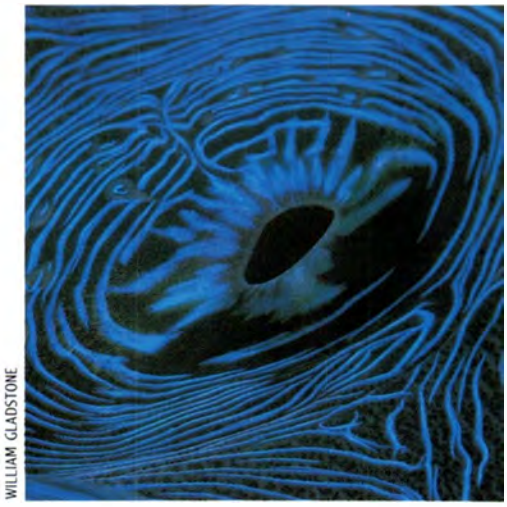
—S. Harvey
Brisbane, Qld

A: The only situation that might constitute 'an emergency' for a sloth is the possibility of predator attack. The major predators would be the Jaguar or other big cats, and any speed that the sloth can attain would not help it if it was caught on the ground by these animals. Sloths, however, are not entirely defenceless as their large powerful claws can inflict severe wounds.

—Linda Gibson
Australian Museum

Answers to Quiz in Quips, Quotes & Curios (page 13)

1. Stephen Hawking
2. A type of pottery
3. The males give birth to the young.
4. Wolf Creek Crater (WA)
5. Brazil
6. 1989
7. Australian Institute of Marine Science
8. Eight
9. James Lovelock
10. Pavarotti. (He, presumably, has more hair on his stomach to direct fluff into his navel.)



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The Human Genome Project has become an unholy scramble for the proprietary rights of human genes.

THE GENOME GOLD RUSH

BY JOHN MERSON

IMAGINE A SITUATION WHERE A MICROBIOLOGIST searching in the more uncharted regions of our DNA stumbles across an undiscovered gene, one whose function is also unknown. On announcing the news, his or her research institute takes out a patent on the discovery. The gene might one day prove to have some commercial use, perhaps leading to the development of a new diagnostic test or drug. This is scientific capitalism in action.

It's a bit like what happened when the late Lang Hancock flew over the Pilbara. He noticed a reddish rust colour in the rock below, concluding that there was iron in "them thar hills". Further inspection proved his assumption to be correct and he proceeded to take out a mining lease on the whole area. From this, the Perth butcher's phenomenal fortune and troubled dynasty was built.

It might seem like stretching the analogy, but Jim Watson's resignation from the leadership of the $US3 billion Human Genome Project is directly connected with this issue. His departure has many researchers in the US and other countries convinced that something like a genome gold rush may well follow. The US Human Genome Project was formally launched with great idealism in January 1990. It was to be biology's first shot at big science. The task was daunting to map and sequence the three billion nucleotide bases, which form the strings of DNA in the 100,000 genes of the human genome. Over a 15-year period, teams of scientists from around the world were to be coordinated through the US National Institute of Health (NIH) and the Department of Energy. These genetic cartographers were to build the maps that would reveal how the various sections of DNA in our genes govern our physical and mental development and, more importantly perhaps, how they make some of us prone to certain types of disease.

The first indications that all was not well with the venture came in 1991 when Dr Craig Venter, from the National Institute of Neurological Disorders and Stroke in Maryland, filed a patent for 337 genes that had been isolated by the new complementary (or cDNA) technique. This approach makes it possible to locate virtually all the genes in the human genome but without being able to define their specific function. It has been estimated by some geneticists that as little as ten per cent of our genes are significant in effecting our physiological functioning; the other 90 per cent may well be important, but the simple truth is that we just don't know. One of the goals of the Human Genome Project was to resolve this point.

One consequence of the patenting fracas would be a restriction on the international flow of scientific information.

What the filing of a patent claim for 337 unspecified genes does is to suddenly shift the Human Genome Project from being a cooperative enterprise concerned with advancing scientific understanding of the human genome to an unholy scramble for proprietary rights among the international teams that had all agreed to participate. Dr Venter and his colleagues now estimate that, by simply concentrating on identifying genes using the cDNA technique, it might be possible to sequence the commercially useful end of the human genome in four to five years at a cost of as little as $US10 million. Hence the rush of research organisations to stake out a bit of the genome turf and patent it.

Jim Watson was fundamentally opposed to patenting, arguing that it would inhibit cooperative scientific research. It was the issue that led him into a head-on confrontation with his boss at the NIH, Bernardine Healy. Like most government agencies these days, the NIH is concerned with cost recovery. It clearly doesn't want to see the fruits of its investment simply being transferred over to the private sector with no benefit returning to either the scientists or the public institutions that carry out the crucial research. There are already many patented diagnostic and other medical products now on the market as a result of recent genetic research. Most pharmaceutical companies are also aware that gene research is the real growth area for new drugs and therapies.

However, there is more to patenting than just lodging a claim. The problem for the NIH is that, because Venter has relied on cDNA techniques, it's not possible to define what the genes he has discovered actually do. Fortunately, or unfortunately, patent law has evolved from the 16th century to deal with inventions and not discoveries. One of the requirements that a patent must have, apart from being unique, is the need to have a clearly defined function. Now there is considerable doubt whether Venter's patent will stick, but the NIH supporting this approach has sent shock waves through the international genome research community. There have been protests from the European Community, Japan, China, the Royal Society in Britain, the American Society of Human Genetics, and even the other US agency promoting and funding genome research, the US Department of Energy.

One consequence of this patenting fracas would be a restriction on the international flow of scientific information. Professor Grant Sutherland from the Adelaide Children's Hospital, and one of the few Australian researchers working under contract to the US Department of Energy as part of the Human Genome Project, believes that many scientists are now not releasing data until the issue is resolved.

The unseemly haste with which the NIH, and other institutions, have staked out their claim to the potentially lucrative genome territory is reminiscent of the carving up of Africa and China by the imperialist powers during the 19th century. There are important issues of public interest and equity at large, and it is not unreasonable for the NIH to want to protect its massive investment of public funds. But to blur the distinction between the process of generating knowledge and the creation of commercial products, by taking out patents on unknown genes, is very short-sighted indeed. It may well mean that, in the heat of commercial wrangling, the scientific goose gets cooked long before it has had time to lay its golden egg. ■

John Merson is a Senior Lecturer in the School of Science and Technology Studies at the University of New South Wales and a member of the ABC Science Unit.

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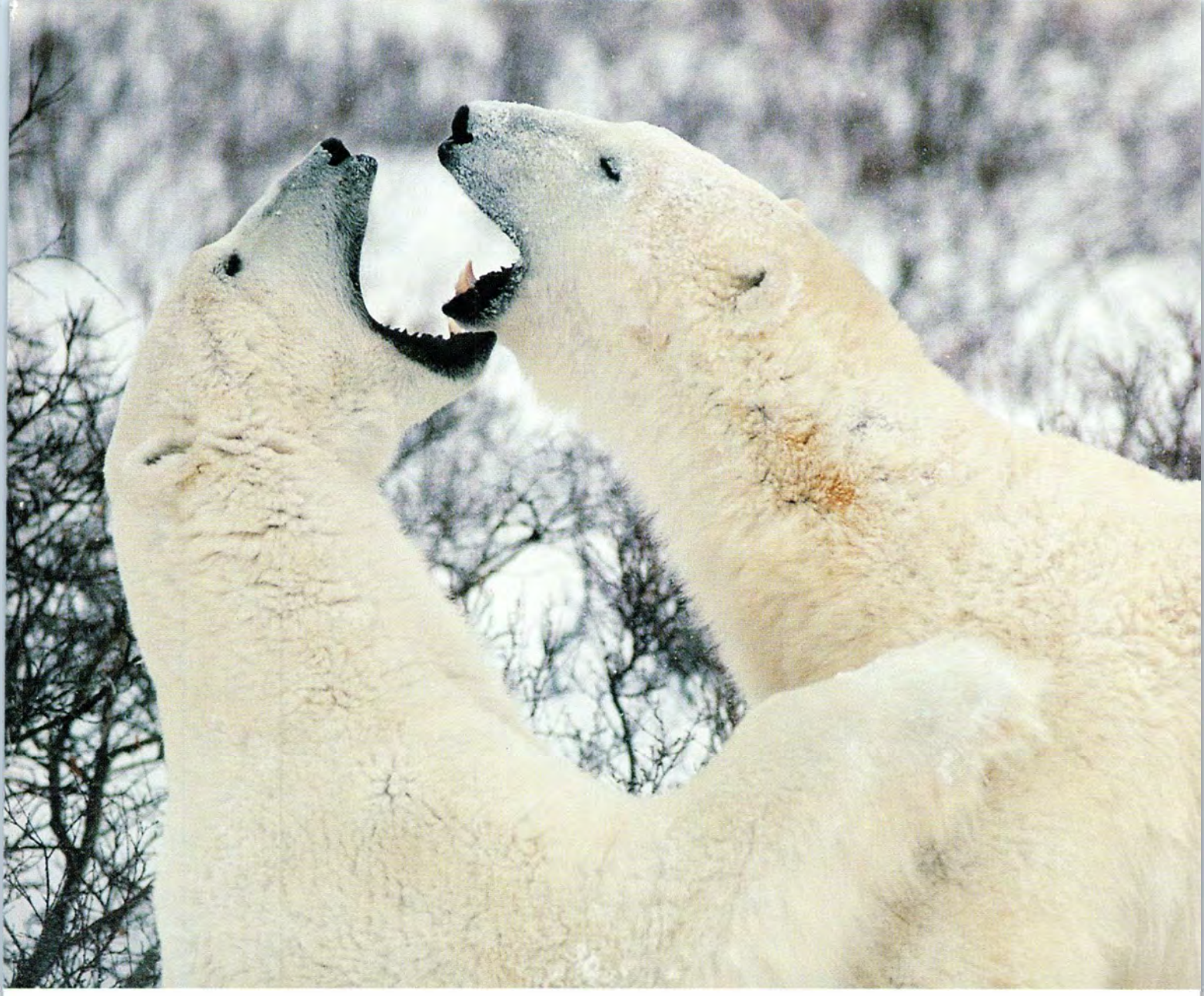

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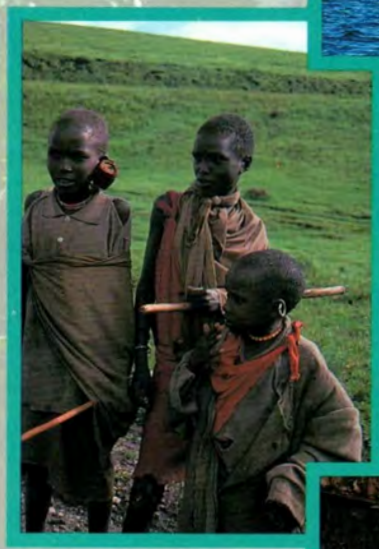

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