paradise

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Editorial — Bob Hawkins
Design — Tom Cooke
John Devereux
Art — John Tau
Typesetting — Kath Williams
Advertising — Margaret Bates

Advertising
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Welcome aboard

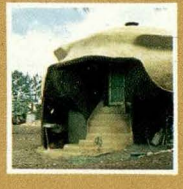
Paradise goes underground in this issue into a wonderland which is attracting a very special kind of visitor to our shores — the caver. This is a person who delights in exploring the mysteries of the nooks and crannies of the earth's surface, often resulting in exposure to great personal danger.

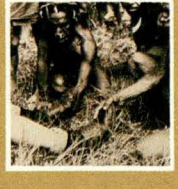
Papua New Guinea, because of its geological make-up, is literally riddled with caves and shelters, and, since the discovery at Bibima of the Southern Hemisphere's deepest recorded cave, it has become the destination of cavers from all over the world.

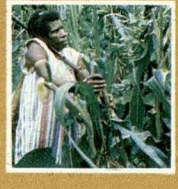
Most travellers, I know, prefer to keep their heads above ground, but I'm sure you will agree, as a result of looking at the articles on pages 17 and 18, that the total grandeur of our country is not always clearly visible to the eye.

We're keeping our fingers crossed that one day a caving expedition will find the world's deepest cave here.

Joseph James Tauvasa
General Manager







Cover: Detail from a silkscreen print by Kauage, probably Papua New Guinea's best known artist, entitled *Meri karim pikinini long bus* (Woman giving birth in the bush), created at the PNG National Arts School 1980. Photograph: Maureen MacKenzie

The Ok Tedi Project – perched on Mt. Fubilan's golden crown in the Western Province of PNG. Morgan Equipment will be there delivering the equipment and providing support services for the contractor: Bechtel/ MKI. Old familiar names like Komatsu, P&H, Mack and others will be at work on roads, dams and other mine service facilities. In many ways, Ok Tedi parallels our involvement with the Bougainville Copper Project, 12 years ago. Since then, we have been servicing PNG's flourishing mining, construction and logging industries. Our face will become a more familiar one in the Western Province. We're delighted to be a participant.

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We're about to become an even more familiar face in Papua New Guinea!

'Igloos' in the sun

By Susan Addison

IGLOOS in the tropics? The idea seems absurd. Yet if you drive into the Highlands of Papua New Guinea you will see them mushrooming everywhere. Of course, they're not made of blocks of ice. In fact they are made of ferro-cement and are known locally as 'ferrigloos'. They are one answer to the problem of low-cost housing.

Ferrigloos were born among the *kunai* (grass) and *pitpit* (wild sugarcane) roundhouses of the Simbu village of Mindima in late 1978. They have since proliferated, particularly in the towns of Kainantu and Goroka in Eastern Highlands Province, where they 'flop' defiantly among the rectangular grids of standard government housing.

Ferrigloos defy definition. There is no such thing as a 'typical' ferrigloo because ferrigloos are in constant and visible evolution. Each new building represents an advance in standard and construction technique.

Initially, ferrigloos were intended purely for a rural market. Their advantages over other permanent housing are that they cost little to maintain and are virtually vandal-proof. The company marketing them, Ferrigloo Pty Ltd, also saw a market in providing homes in isolated areas for government workers.

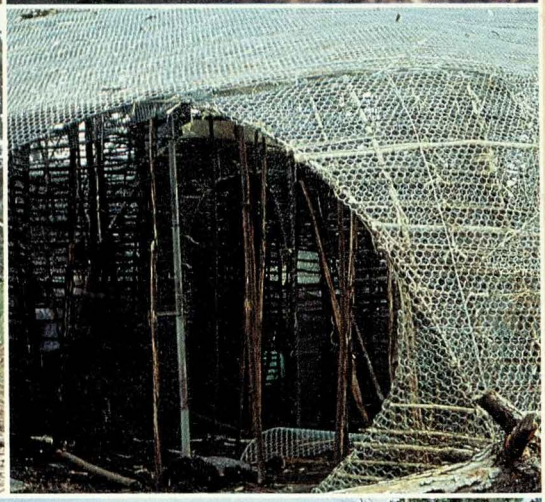
The national Housing Commission praised the ferrigloo but innate conservatism made

Bruce Sowter

From top: *stages of ferigloo construction and interior views*

the marketing process a slow one. Status-conscious public servants regarded with suspicion even the medium-cost ferrigloos (around Kina 4000), developed for urban situations even though they offered all the facilities of adjacent Housing Commission conventional houses. So the company developed a 'high covenant' model which, unlike earlier versions, could be categorised in real estate terms as a 'three bedroom house'. But that's where the similarity ends.

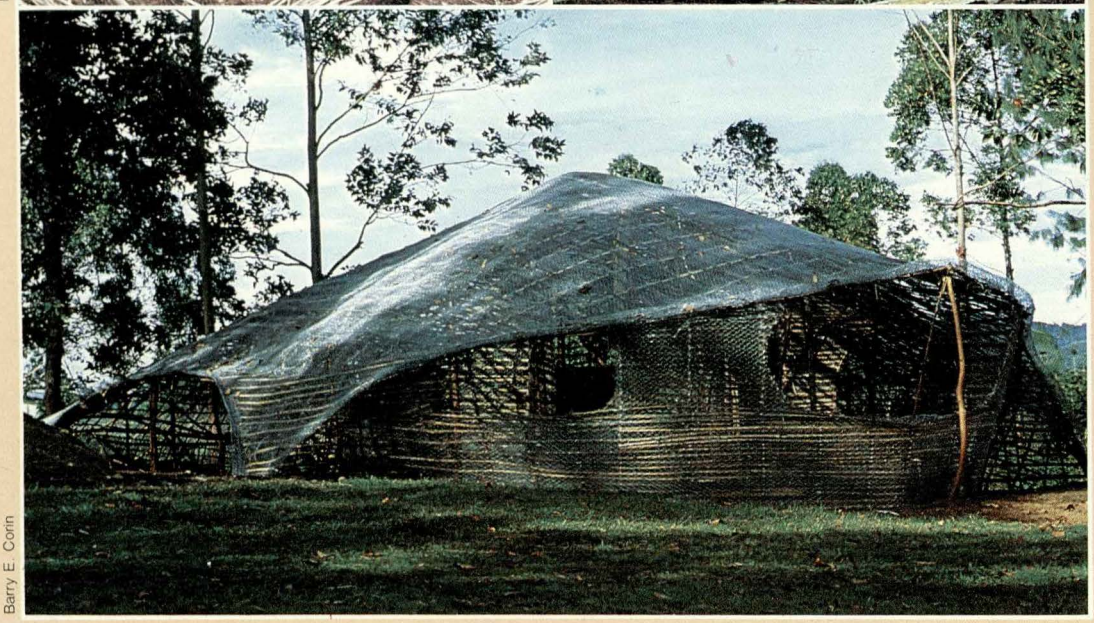
Bruce Sowter



Roger Smith

Inside a ferrigloo, one has the sensation of being in some subterranean grotto which has been unexpectedly exposed to the light and air of the above-ground world. Seats, tables and benches are all moulded into the structure of the building and the house has a 'hand-patted' look as a result of the ferro-ing technique.

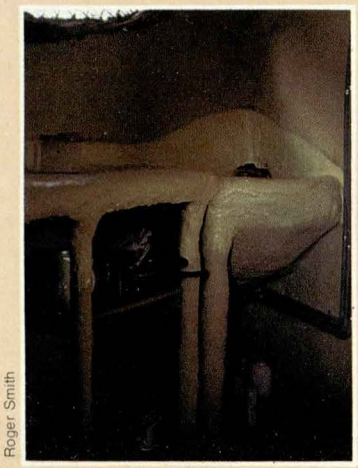
The chance to develop the first high covenant ferrigloo came with a commission from a former minister of finance, Barry Holloway, MP. He commissioned a ferrigloo valued at K10,000 to be built at Kainantu. Housing of a similar standard followed for the Raun Raun Theatre and the Eastern Highlands Division of Health, both in Goroka, the provincial capital. Five minutes drive from Goroka, a village group, Kefamo Avogele, are renting out their ferrigloos.



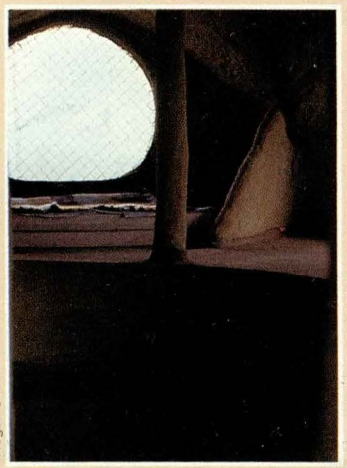
Barry E. Corin

The ferrigloo owes its existence today to 17 years of experimentation in appropriate technology in Papua New Guinea by the company's founder and manager, Bryan Hawker.

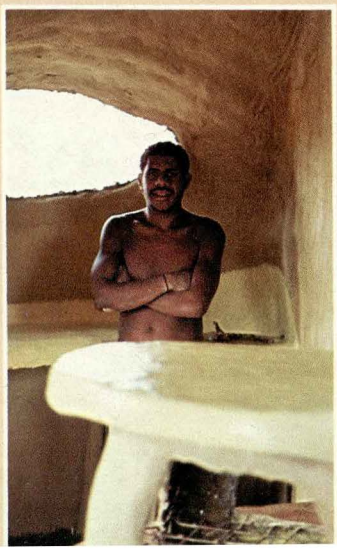
A former vocational school teacher and builder, Bryan was convinced of the need for techniques suited to the skills of village people. 'We should be trying to adapt techniques to the



Roger Smith



Roger Smith



Fireplace and main living area

Roger Smith

vast range of existing skills of the people, not the skills of the people to expatriate techniques,' he says.

The basic difference between a conventional house and a ferrigloo illustrates his point. The ferrigloo does not have a skeleton structure such as a timber frame which requires precise joints and vertical and horizontal levels. The ferrigloo has a continuous structure which, like the shell of an egg, derives its strength from its shape.

Engineers have run computer calculations to prove that ferrigloos can stand up, but the sight during construction of builders scrambling over the roof would be sufficient proof for most. Ferrigloos have remained undamaged in earth tremors.

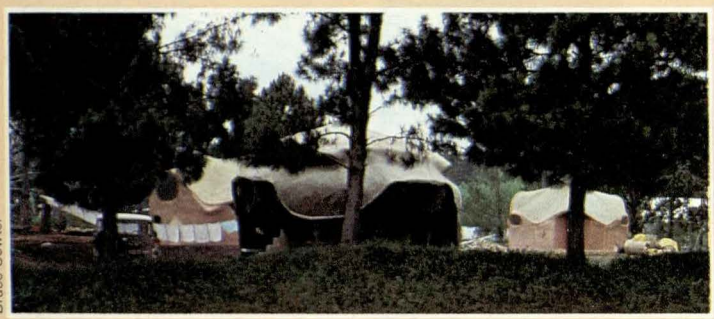
Construction tools are simple: rubber gloves, wire cutters, a hammer, pliers, bushman's saw, a cheap level and foam rubber sponges.

The ingredients are easily obtainable: cement, chicken wire, fence wire, plywood for doors, a water-proofing agent for the inside of the ferro-cement water tank and a waterproof membrane for the walls and roof. All of this can be loaded onto one truck — an important consideration for buildings in remote areas.

The sand, water and framing material appropriate to the site (bamboo or *pitpit* in the bush or sawmill offcuts in the towns) are usually obtained by arrangement with local people.

Ferrigloo Pty Ltd evolved its own style of business operation. Its four young directors from Simbu Province, Bob Waim, Aru Fabian, John Wena and Katie Hawker, have earned their status through hard work. Their unpaid labour during foundation years was considered their 'investment'.

The first ferrigloos built in the Highlands at Mindima, Mingende and Onkoli, were all constructed on a cost only basis. Karamui Spice Company and



Bruce Sowter

Roger Smith

Ferrigloos blend in with the Highlands landscape

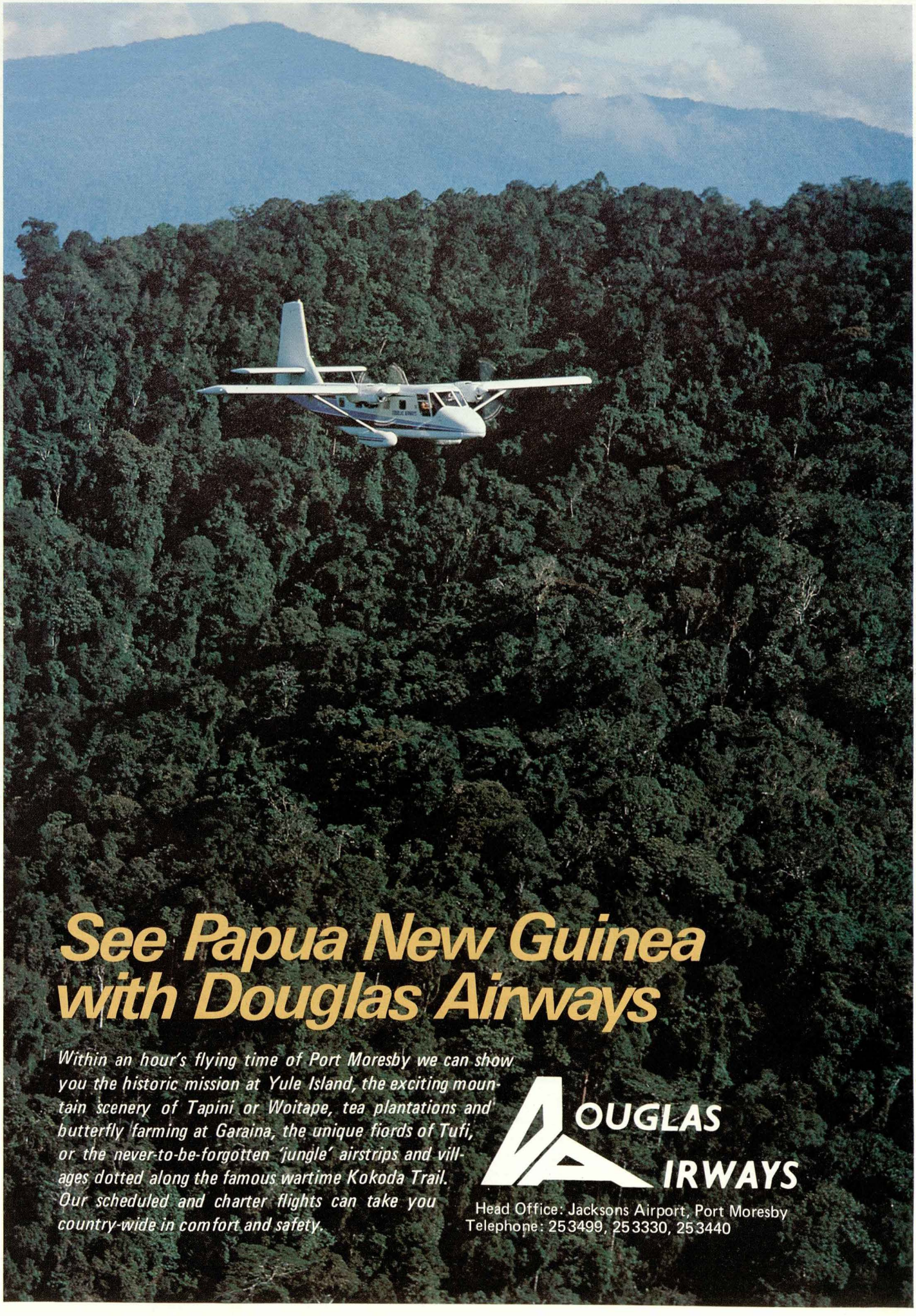
Bruce Sowter

Aiyura National High School projects brought the first payments for labour. At last the hitherto unpaid labourers were able to elevate their diet beyond '*kaukau* (sweet potato), *kumul* (bird of paradise) and a pinch of tea in a bucket'.

Ferrigloos directors and workers accept that no one gets rich from low-cost housing. However, their progress payment system ensures a 'fair day's pay for a fair day's work', says Bryan Hawker. With orders coming in there is now incentive to complete contracts as quickly as possible and move on to the next job.

In the past three years the company has proved it can meet exacting standards of health and planning authorities in urban areas and has assured a place for itself in the 'alternative housing' market.

Cultural acceptance of these unconventional houses has been slow but commissions are flowing in steadily. You can argue about the aesthetics of a ferrigloo but it is much more difficult to fault the company's claim that it has produced a sound, hygienic house which village people can afford and make for themselves. — *Susan Addison is a correspondent of* The Times of Papua New Guinea *based in Lae, Morobe Province.*



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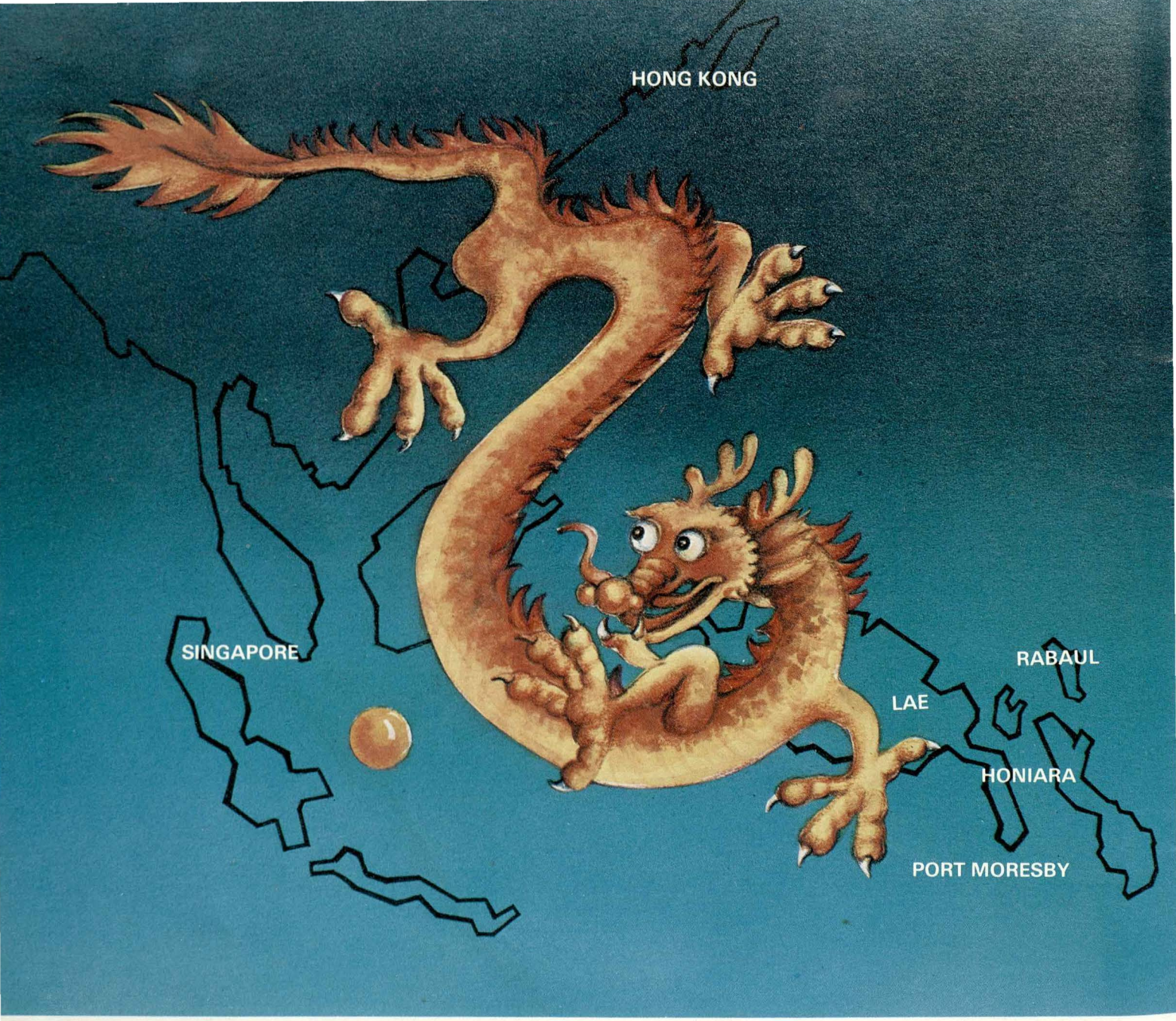

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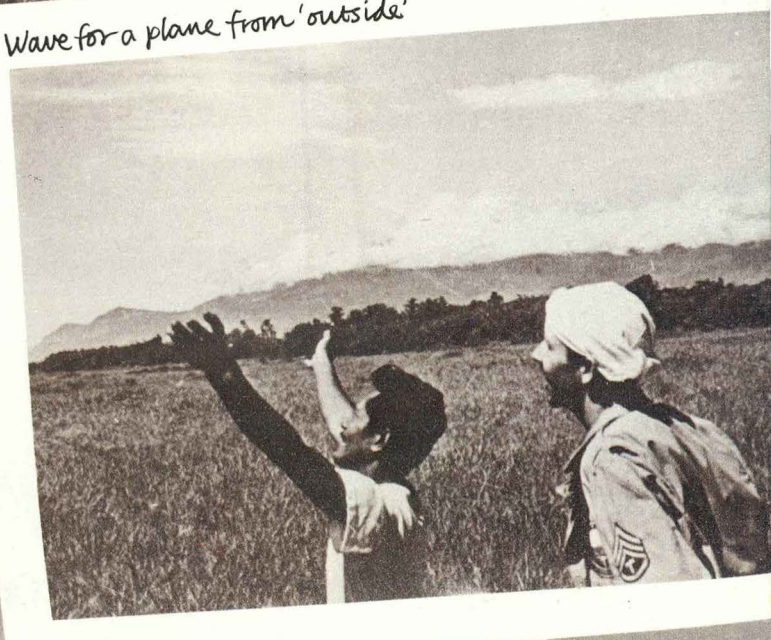
ESCAPE FROM 'SHANGRI-LA'

Walkie-talkie contact

Waiting for a lift out of the Baliem



Wave for a plane from 'outside'

Story: Robert Piper
Photography: Alex Cann

THE Baliem Valley, a fertile, pleasant land, high among the central ranges of what is now the Indonesian Province of West Irian, was still a mysterious 'Hidden Valley' to the modern world when C47 transport No. 925 took off from Sentani, on the New Guinea north coast, on May 13, 1945.

The Pacific War was nearly over. Hollandia (now Jayapura), as capital of what was then colonial Dutch New Guinea, was a largely sleepy military base. The war had left it far behind.

The idea of a joyflight over Hidden Valley was a popular one. Colonel Peter J. Prossen of the Far East Air Service Command organised the show and C47 No. 925 left Sentani, Hollandia's nearby airbase, with eight women and 15 men (including crew) on board. The C47 — known by some as a Dakota and later by the civilian designation of DC3 — droned steadily upwards into cooler temperatures.

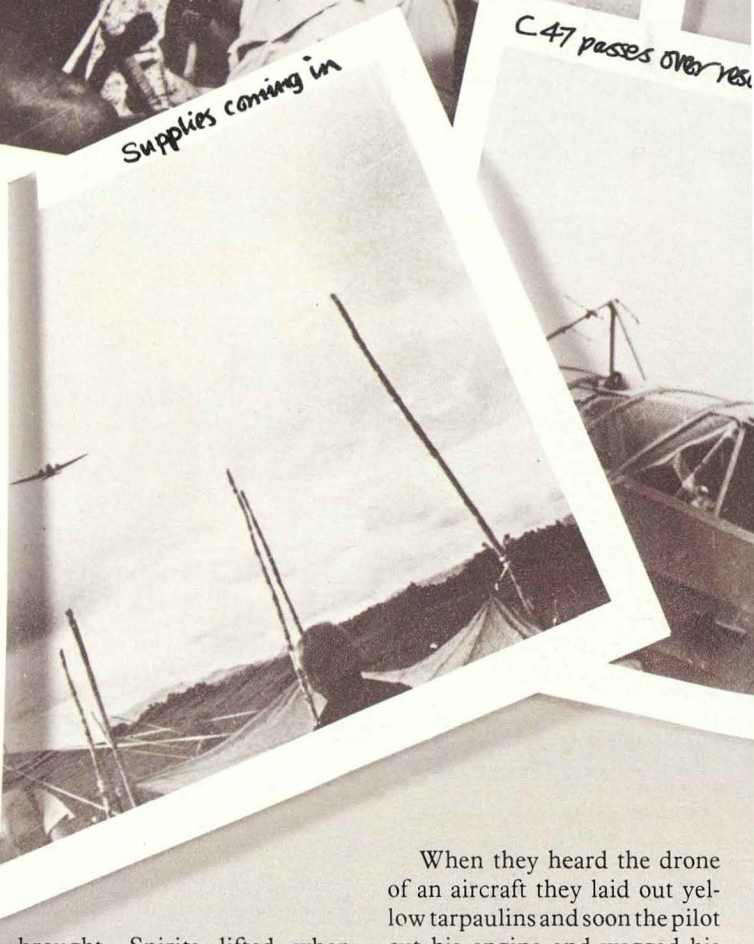
There was an air of excitement on board. Rumour had it that Hidden Valley could prove to be the scene of a lost civilisation. The aircraft flew about 300 metres above ground level, giving its occupants clear views of the tiny villages and hillside gardens. The terrain was rising rapidly but the C47 easily made altitude.

Just as it was nosing carefully over what was believed to be the final ridge of the Pas Valley — the 2900 metre northern access through the ring of peaks guarding the Baliem Valley — the aircraft was snatched downwards by a massive down draught.

First it only clipped treetops. Then the plane began to lose way. It bounced through high foliage before cutting a swathe through thick mountain vegetation. It came to rest at about 2200 metres. Flames quickly spread through the crumpled fuselage. For most of the occupants the terror was past — they were dead. But three — two men and a woman — managed to crawl and stagger clear. They were First Lieutenant John S. McCollom, Technical Sergeant Kenneth Decker and Corporal Margaret J. Hastings. They had been seated in the tail section which had broken clear of the main fuselage.

A woman's cry was heard from the wreckage and McCollom went back in. He reappeared pulling PFC Eleanor Hanna with him. Hanna was in a bad way and near death. Going in a second time he brought out Staff Sergeant Laura Besley who was in shock and hysterical but otherwise, apparently, uninjured. Both women had also been in the rear of the transport.

The intensity of the fire increased. (The wreckage was to



burn, spasmodically, until the afternoon of the following day.) The survivors retreated to a ledge several metres away, McCollom carrying Hanna.

As afternoon rain began to fall, McCollom made several trips to the wreckage, recovering whatever he could get his hands on. He brought back tins of water, hard sweets, yellow tarpaulins and a signal kit from emergency liferafts. He tried not to think about his twin brother whose remains were in the smouldering wreckage or of the pain from a broken rib.

As night approached, the survivors swathed themselves in tarpaulins. Ahead lay a long, cold, uncomfortable night. With the dawn it was found Eleanor Hanna had died. She was carefully wrapped in a canvas square and laid beside a nearby tree.

That morning, the remaining four saw the first search plane fly over. (In all, 24 aircraft were to be involved in the search.) Although the group signalled with a mirror they were not seen.

The previous day had been Ken Decker's birthday. He was not impressed at what it had brought. Spirits lifted when they knew a search had begun, but hope was not enough for Laura Besley: she died in the afternoon and was placed alongside Eleanor Hanna.

At daylight on Tuesday, May 15, the three survivors began a slow trek down the mountainside in search of more open ground. They worked their way along the banks of swiftly-flowing torrents and across waterfalls until they reached a clearing at mid-day. Margaret's long hair had repeatedly become entangled in clinging branches and when they rested she asked John to cut it with his penknife.

When they heard the drone of an aircraft they laid out yellow tarpaulins and soon the pilot cut his engine and wagged his wings to say he had seen them.

That afternoon a large group of shy Highlanders came to the grassy knoll the survivors were occupying. The local people, discussing the strangers amongst themselves, puffed away on mountain tobacco. Clearly they were a friendly crowd and this was welcome relief for the exhausted Americans.

On Thursday morning, May 17, a radio was dropped by parashute and contact was quickly made with circling aircraft. The survivors gave their names and brief details of the tragedy.

Food, jungle kits, medicine, bandages and knives were dropped.

They found they were at first only able to eat small quantities because their stomachs had contracted through lack of food over the previous four days. On Friday a plane dropped two medical paratroopers further down the valley in more hospitable country. One of them, Corporal 'Rammy' Ramirez, injured his ankle but, with fellow-Filipino Staff Sergeant Ben Bulatao, he was able to get to the survivors' camp, some of whose wounds were beginning to turn septic and were in need of modern medicines.

Ken Decker's right elbow was found to be broken; his back was burnt; and there was a deep gash in his scalp. Hastings' right foot was badly cut; her legs were burnt; and the left side of her face was blistered. The medics lit fires and hot food and drink soon began to work wonders for the morale of the wounded.

On Sunday, May 25, a transport aircraft dropped Captain David Walters and 10 paratroopers in the main Baliem Valley, about 70 kilometres to the south. Two set up base camp and began to prepare a glider strip while the rest set out for the survivors. They reached them five days later.

Walters and a burial party then set off up the mountain to the crash site. They took with them 20 crosses and a Star of David. When these were erected, with identification tags placed on each for the seven women and 14 men, an aircraft circled overhead. Representatives of the Catholic, Protestant and Jewish faiths broadcast funeral services. The survivors on the grassy knoll listened, with heads bowed, to their radio.

By June 15 — nearly three weeks after being joined by the paratroopers — the three survivors were fit enough to walk to where the glider strip was waiting. At the base camp were large partitioned tents and even a makeshift bath. Assorted shells had been flown in to barter with the people of the Baliem for pigs and other food.

On June 28 a C46 Curtiss Commando towed a Waco CG4A glider into the valley. Piloted by Lieutenant Henry E. Paver, the glider swooped in for a perfect landing on the less-than-100-metre strip. Meanwhile a C47, affectionately named Leaking Louise, circled waiting to snatch up the towline which was being prepared down below.

In the first glider load was Paver, the survivors and the two Filipino medics. Signalled in by radio, the lightly-loaded Leaking Louise, piloted by one Major Samuels, swept into the

valley in a shallow dive. On his first pass, Samuels caught the snatch line between two posts and roared on down the valley. As the glider slithered down the strip it snagged an old supply parachute on its skid. Luckily it didn't reopen though it did create some drag as it trailed under the glider. The C47 clawed for altitude in the thin atmosphere. Its speed dropped to around 170 kph and some trees were barely cleared. But then it was up and into tight circling altitude.

Then the two aircraft headed north for Sentani. The dragging chute continually slapped the thin wooden floor. A hole was eventualy beaten through the thin ply, giving the passengers a clear view of the jungle below.

One-and-a-half hours later the glider was released over the coast and it settled to a gentle landing in Hollandia.

Waiting journalists, who had already dubbed the Baliem 'Shangri-la' after James Hilton's *Lost Horizon* fantasy, busily photographed and questioned the survivors. Understandably, all three had little to say. Although they were tremendously relieved to be back after 47 days from a trip which should have lasted only a few hours, their thoughts dwelled on the 21 friends they had left on the mountain.

In late October 1958, Dutch officials, exploring in the area of the Pas Valley for the wreckage of a missionary aircraft which had crashed in 1954, rediscovered the wreckage of the C47. An American search and recovery team from Hawaii arrived in Hollandia in November of the same year. They flew into the Baliem Valley, which by then had its own airstrip at Wamena, where they were briefed by Dutch officials. A party of 31 men left on December 4 for the crash site where they gathered the remains of those who had died 13 years before and returned them to the United States.

The Baliem Valley, despite the media, is no Shangri-la. It is a place of superb and lonely splendour; home to a now peaceful people known generally as the Dani. It is a place of fickle weather conditions: clear skies can soon close in; calm days can be whipped by unexpected winds. Pilots, even today with modern aids unheard of in the days C47 No. 925 went on a joy-flight, treat the Baliem Valley with the greatest respect. — *Robert Piper is Historical Officer for Air with the Australian Department of Defence.*

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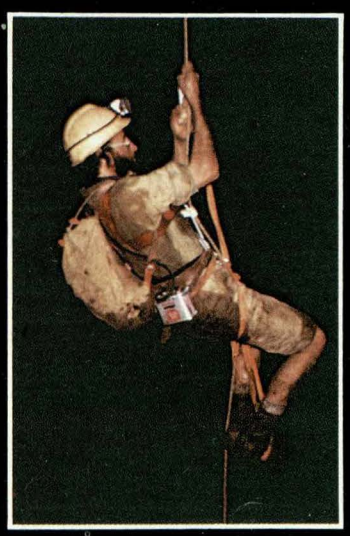
Cave men — and women — from all over the world are drawn to Papua New Guinea like bears to honey. The whole island of New Guinea is riddled with caves and it is not yet known if Papua New Guinea is home to the world's deepest cave. Michael Bourke, who has been exploring caves in Papua New Guinea for more than a decade, examines the country's potential as a caver's wonderland, and, in a separate article, looks at the links between Papua New Guinea's caves and its people.

Light streams in the entrance of a cave near Kantebu on New Britain; **below:** *author Michael Bourke uses mechanical devices, known as prussikers, to climb in Meabin cave on New Ireland*



A Cave Man's Holey Land

LIMESTONE is a vital ingredient in the formation of most types of cave and Papua New Guinea has no shortage of it. In fact, limestone is found in every province. On the main island of New Guinea, a huge limestone belt stretches northwest from the Gulf of Papua through the Gulf and the Southern Highlands provinces and then into the ranges of the Enga, Western Highlands and West Sepik Provinces, before heading off into neighbouring West Irian. Much of the Huon Peninsula in Morobe and Simbu Provinces and the islands of New Britain and New Ireland are limestone.

But it is not just the fantastic number of cave formations which has made Papua New Guinea a speleologist's Mecca; it is the potential for cave depth and length. The potential of a cave system is determined by the difference in height between where water goes underground and where it comes out again, because it is the water which forms caves as its very weak carbonic acid component slowly dissolves the limestone.

In some places the depth potential is more than 2500

metres, far greater than the 1410-metre deepest surveyed cave in the world in the Jean Bernard system in France.

The secrets of caves in the Himalays are likely to remain secrets for many years to come. Because of their altitude and the fact that caves are blocked by frost-sheltered rocks, Himalayan caves are, for the moment, impossible to explore.

In recent years caving expeditions have come to Papua New Guinea from Australia, New Zealand, Japan, Britain, France, Spain and Switzerland. In almost every major caving journal worldwide there is something about Papua New Guinea. The deepest recorded caves in the Southern Hemisphere are at Bibima in the Porol escarpment east of Kundiawa, capital of Simbu Province. Bibima (494 metres) was first bottomed in 1972 by a group of Kundiawa-based explorers.

The longest cave system in Papua New Guinea is the Atea Kanada system in the Muller Range of the Southern Highlands. An Australasian expedition in 1978 surveyed 30.5 kilometres of passage in the cave, making it about the twenty-fifth longest in the world. Another long cave is the Selminum Tem in the Hindenburg Range west of Telefomin in West Sepik Province. In 1975 a British expedition recorded 20.5 kilometres of passage in Selminum Tem.

An exciting feature of New Guinea's caves are the great drops or 'pitches' in them. Already 26 pitches of more than 60 metres have been found. The greatest of these is the Minye cave, north of Pomio in New Britain, at 270 metres.

In 1978, with a French expedition, I explored the Minye cave. The last 75 metres of the pitch was free of the rock face and I descended too quickly, badly burning my hands. It took me three hours with the assistance of my French friends to climb back up the rope, using only my heavily bandaged left hand.

Papua New Guinea's high rainfall has carved out some enormous surface depressions in limestone which are known as 'dolines'. The largest dolines in the world are all in the Nakanai Mountains of New Britain. They are many times larger than other well-known dolines in Venezuela and Mexico.

Some underground chambers in Papua New Guinea also are of enormous size. A huge chamber in a cave on the Keriaka Plateau of Bougainville is the world's equal second largest. Caves have been found as high as 3800 metres above sea level.

Perhaps the greatest challenge to speleologists in Papua New Guinea are the great un-

Limestone towers near Poroma in the Southern Highlands

food from the land

CAVES, for many thousands of years, have played both a productive and spiritual role in the lives of Papua New Guineans. They still do.

Though there is little evidence to suggest that caves were used as permanent homes, as they were used by the classic European 'cave man', they have often been used as temporary shelter, perhaps in times of tribal fighting or other crisis, or when people have been foraging for food.

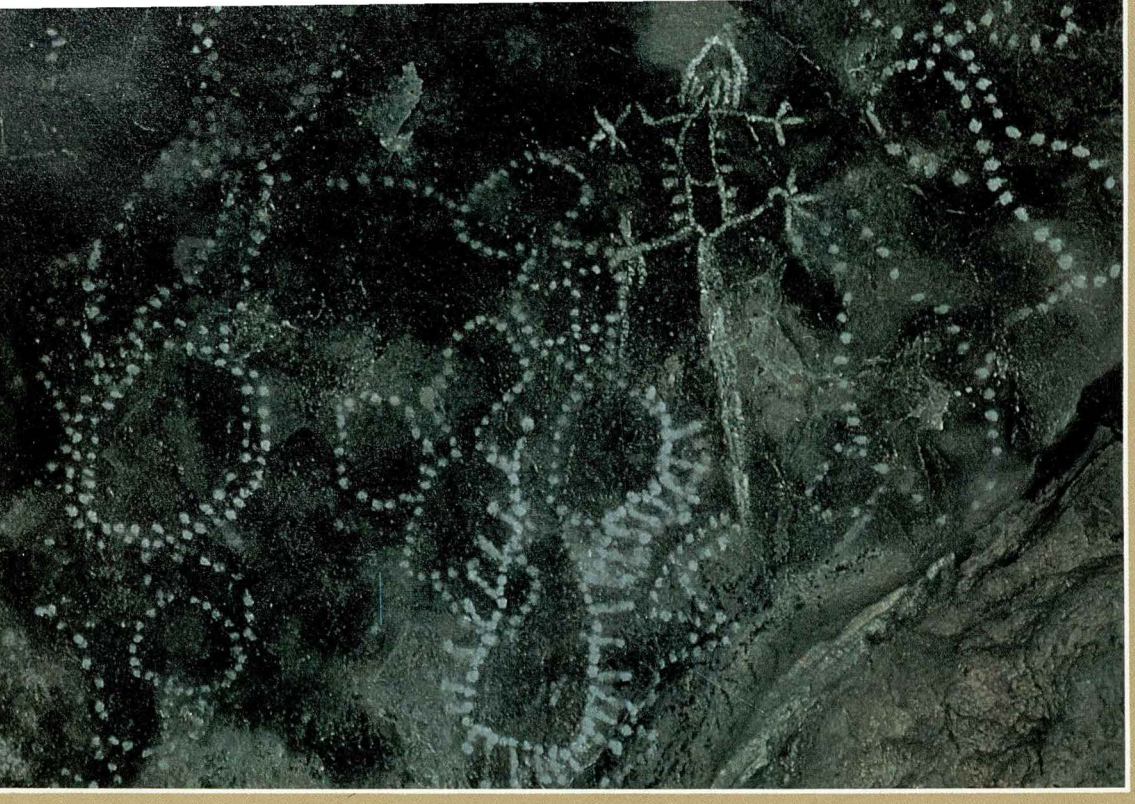
During the Pacific War, when people fled from their villages in face of the invading Japanese army and Allied bombing, caves became home for an extended period.

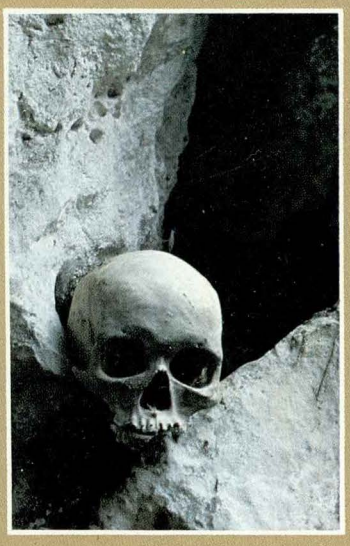
In some societies it was traditional for women to have their babies in caves. Where caves did become permanent residences, they were usually dry with daylight penetrating.

It is from caves such as these that much of New Guinea's pre-European history is being gleaned. Archaeologists, excavating rock shelters and caves, especially in the Highlands provinces, have found stone tools and pollen samples which tell much of human and agricultural activity over thousands of years.

Protein has been a problem in many Papua New Guinean societies. Some tribal groups have been able to fill this gap by catching animals such as bats, eels and young swifts in caves.

Below: *skull and bones in burial cave;* **below right:** *multi-coloured art at Kafiavana rock shelter in the Asaro valley near Goroka, Eastern Highlands*





Above left: *a variety of creatures decorates Aibura cave near Kainantu in the Eastern Highlands;* **above:** *skull in the Walip burial cave on Nembi plateau in the Southern Highlands*

Caves also are often a source of water in times of drought.

When I have gone on caving expeditions, the Papua New Guineans who have accompanied me have always carried sticks to help them kill flying foxes and bats. These animals are quickly roasted on an open fire or boiled. Another hunter's technique is to build a structure across the mouth of a cave. Bats are caught in them when they try to leave their caves on nocturnal hunting trips.

Once, in 1975, when we were exploring a cave near Henganofi in the Eastern Highlands, we were about to descend an impressive 50-metre drop at the entrance. 'We don't go down that side,' said a local man. 'We go down on the other side of the drop.' We found that the people from a nearby village used bush vines to climb down into the cave where they found it relatively easy to get a good haul of flying foxes. We were told that 40 or 50 years ago several men were killed when the vines they were climbing down had broken and sent them plunging to the bottom.

Cave entrances and rock shelters are used in some areas as a final resting place for remains of the dead. The shelters of Snake River and Aseki in the Morobe Province are particularly well known.

In 1963 three Simbu men were murdered near Obura in the Eastern Highlands. Their bodies were thrown down a shaft. A policeman from Buka Island in North Solomons Province by the name of Larius was lowered down the shaft on a rope. He was able to find only one body. When we explored the same cave in 1978, we found a human skull at the bottom. Presumably it was one of the two remaining murdered men.

Tradition has it that in some parts of Simbu Province, people suspected of witchcraft were forced to 'suicide' by jumping down cave shafts.

Cave art is common throughout Melanesia. Caves in Simbu, Eastern Highlands and Morobe Provinces often have rock paintings and occasionally engravings. The paintings are in black and white, using charcoal, or in red, yellow, blue and white clay. Art forms are varied but themes such as lizard-like shapes and spirit women are most common.

The age of the art has not been firmly fixed but rarely do villagers know who did it. Usually they ascribe it to 'spirits'. Sometimes the subjects enable a guess at age to be made. In a rock shelter near the Lamari River, in the Eastern Highlands, there are several layers of paintings, each with a different style. The topmost layer features 'aeroplane' shapes, suggesting they may have been drawn by villagers in the 1920s when the first aircraft were seen over the area.

Not surprisingly, villagers often regard caves as the homes of *masalai* (spirits), particularly the long river caves. As these are the most dangerous of caves, the 'spirit' theory makes good sense in that it keeps people out of them.

In 1972 we explored a large river called Ora in the Nakanai Mountains of New Britain. The village people were frightened for our safety because the cave was the home of a malevolent spirit called Tuke. They warned us we would swell up and die. None of us actually died but one member of the party developed a severe infection in her leg and had to be carried for three days to the nearest airstrip.

It was in the same area that I slid too quickly down a rope in a pitch, developing enormous blisters on both hands. The villagers were not in the least surprised. A year later a Swiss caver was drowned.

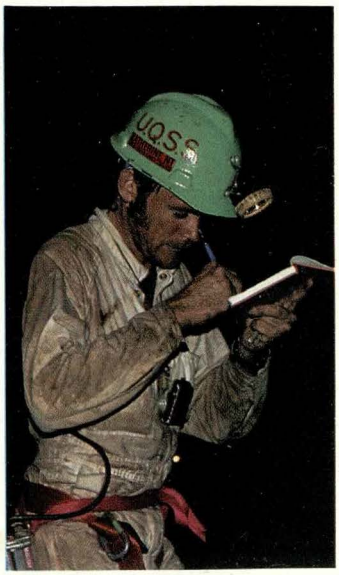
Though caves are no longer used for burial purposes, they still play an important role in the food gathering activities of subsistence villagers.

derground rivers. These are dangerous and difficult to explore. In 1978 a Swiss explorer was drowned trying to cross an underground river flowing at 15 cubic metres per second in New Britain. Nowhere else in the world are underground rivers so powerful and perilous.

As well as forming caves, the action of water has produced unusual rock formations in limestone. On Mount Kaijende near Porgera in Enga Province, limestone pinnacles rise more than 100 metres from the mountainside to knife-edge points. In many Highlands areas towers of limestone rise 40 metres above surrounding plains. These surface formations have attracted the attention of geomorphologists from far and wide.

Though Papua New Guinean villagers have been familiar with the caves in their own areas for aeons, the scientific era of cave exploration began only in 1960 when the Port Moresby Speleological Society (PMSS) was formed. Exploration by PNG-based cavers has continued to the present under the auspices of the PMSS, the Goroka Caving Club and the PNG Cave Exploration Group.

Mounting a caving expedition can involve years of planning and preparation.Then, when an expedition is actually



Against a background of flying foxes clinging to the roof of a cave in New Ireland, **clockwise from left:** *a caver takes careful notes in a large cave on New Ireland during the Australian-PNG expedition; a stream passage in Barananomba cave near Yonki in the Eastern Highlands; and PNG-based caver Geoff Francis records the water temperature in a cave on Los Negros Island in Manus Province*

under way, getting to the most interesting caving areas can involve days of hard walking.

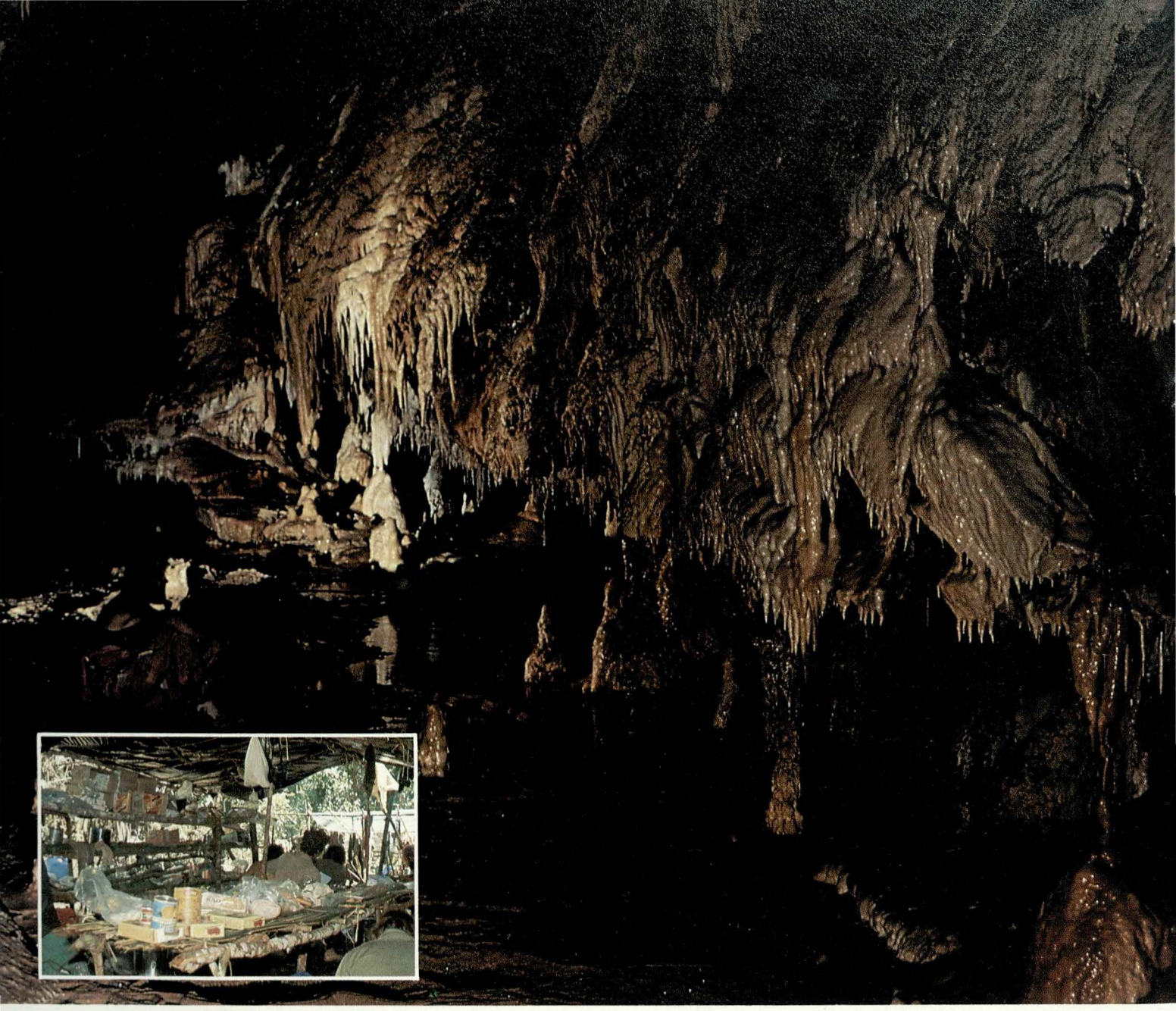
In 1972 I led a six-man expedition to Ora Cave in the middle of New Britain. It took a week for the full expedition to get to the cave although on an earlier reconnaissance trip I had taken only three days. For a large expedition, several tonnes of food and equipment must either be carried in or air-dropped.

Organisational problems for groups with limited finance are daunting and the underground exploration which follows is usually arduous. It can be a slow, tedious job properly surveying and describing cave systems in details. But rewards can be great. As well as the prospect and challenge of previously unexplored systems, there is always the prospect of discovering a record or, for the biologist, new species of underground life.

The first foreign expedition to Papua New Guinea was the 1965 Australian Star Mountains team. It went into near-inaccessible areas along the border with West Irian and the results were disappointing. As a consequence, Papua New Guinea was dismissed by cavers for the rest of the sixties.

In 1971 a small Japanese expedition visited Simbu and Southern Highlands and in the early seventies local groups were active in the Highlands and on New Britain and New Ireland.

It was the successful exploration of Bibima in 1972 and the new Southern Highlands depth record which brought the spot-



Above: *Rimstones, shawls and other formations decorate Irukunguai cave in Simbu Province;* **inset:** *cavers' canteen during the 1975 Lelet plateau expedition in New Ireland;* **left:** *Michael Bourke, complete with survey and vertical rope-work gear, emerges from a cave in New Ireland*

light back to Papua New Guinea again. It's been there ever since.

Foreign cavers visited New Britain, New Ireland and the Muller Range in the Southern Highlands. The successful British expedition in 1975 caught the attention of European explorers and, after this, teams from Europe began a procession to Papua New Guinea. They were well equipped and comprised some of the best cave explorers in the world. Records continued to fall.

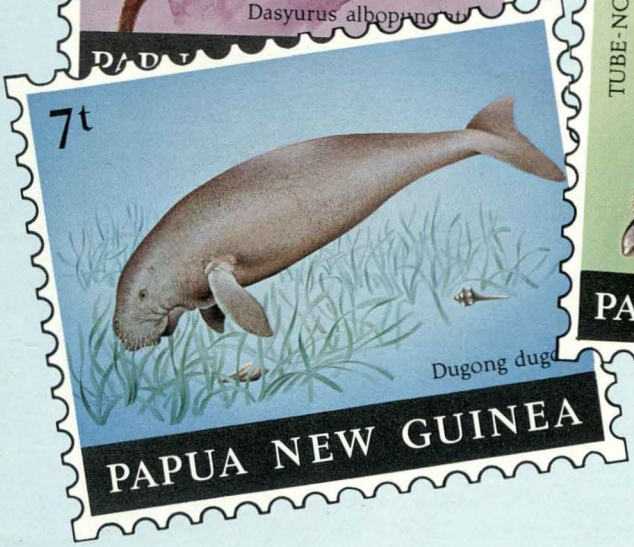
It's not just a question of cavers obtaining pleasure and satisfaction from their expeditions. They are providing Papua New Guinea with a valuable and systematic documentation of the nation's cave systems. The results of expeditions are published in the *Niugini Caver*, a publication produced in Kainantu in the Eastern Highlands.

Much of the island's pre-European history is now being pieced together from evidence found in cave and rock shelters by prehistorians. Many libraries and archaeologists subscribe to *Niugini Caver* because sites of potential significance are described in it.

Cave explorers, in 1973, were able to warn of problems of water leaking through underground channels in a proposed dam on the Wage River in the Southern Highlands. They also have investigated underground water supplies for villagers.

In iceberg terms, cave explorers in Papua New Guinea have probably only uncovered the tip. Our caves are going to become more famous as deeper and larger systems are found.

Stamps of Papua New Guinea



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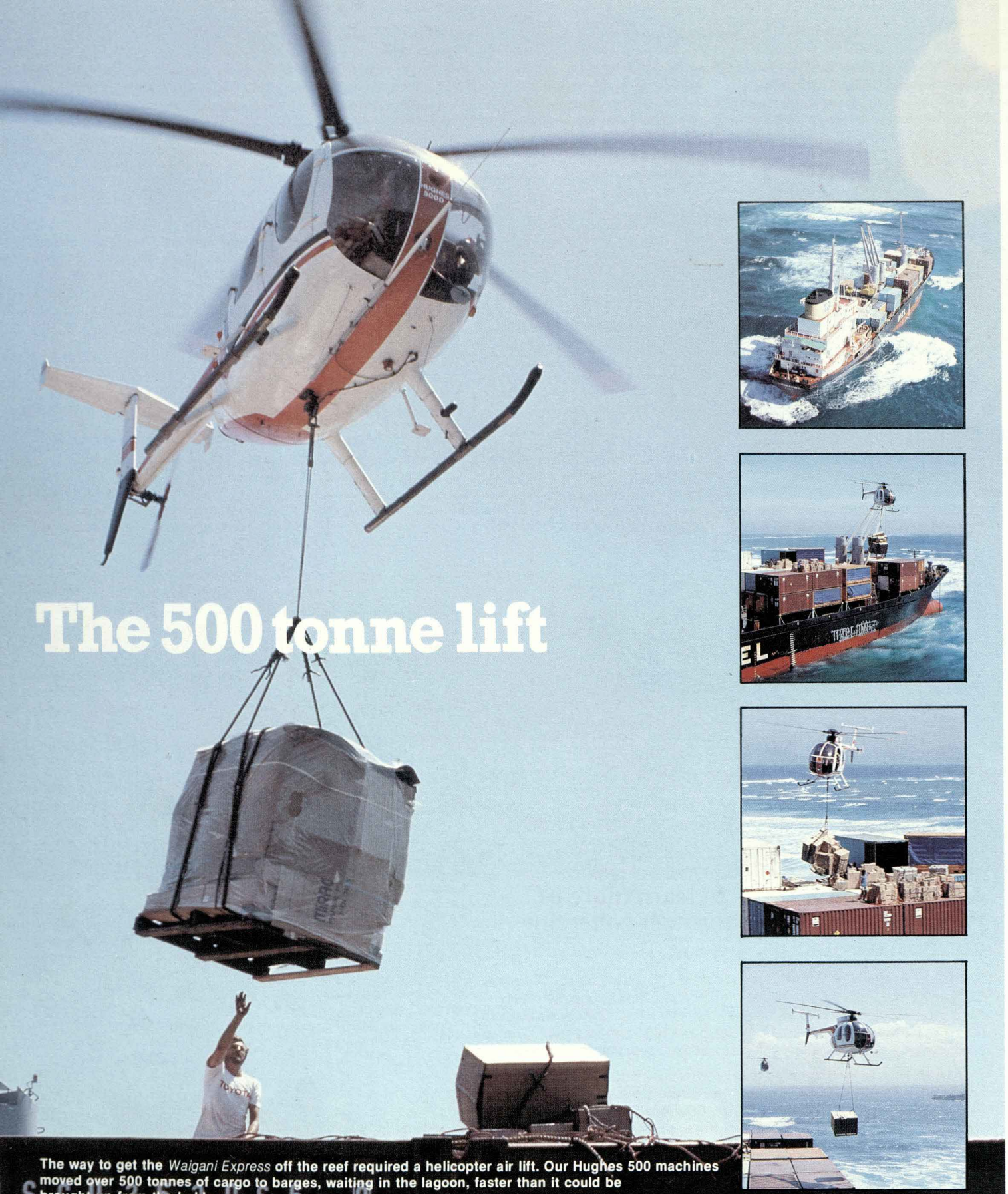

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Mick, Mick & 'Makarai'

By Peter Munster

Old men in the Goroka Valley in Eastern Highlands Province can just remember when the first 'red' men — the* gorohave *— came into their world. It was November 4, 1930. The people of this beautiful highlands valley are emphatic that before the two white gold prospectors arrived they did not have an inkling that such people existed.

Allan Robertson

WHEN Michael James Leahy and Michael Igantius Dwyer, with their small band of New Guinea coastal carriers, walked into the Goroka Valley, the local people greeted them with cries of 'Makarai, makarai.' It was the word the people had to describe the mysterious source of the occasional steel implement which found its way into the valley along the trade route from the north coast. The people associated the white men — whom they sensibly saw as red — with those steel implements.

On that day, Mick Leahy wrote in his diary: 'Left camp (on Dunantina River) 5.45am, crossed a very rickety suspension bridge and climbed up on top of *kunai* (grass) ridges . . . Could not get any natives to accompany us past (Karprua) village, so pushed on and camp near the village of Orafaygu (Korofeigu). There is a fair-sized stream (the Bena Bena) running into the Purari and bank of wash about 50 feet high. Mick (Dwyer) took the dish down to try it out and got about three colours to the dish. Nothing in the high terraces.'

Leahy and Dwyer had a well-tried prospecting routine. While one stayed to guard the camp and prepare the evening meal, the other would take five or six carriers and make a systematic search of nearby creeks and gravel beds. 'When we got into camp,' Mick Dwyer recalled, 'one of us would go down the creeks prospecting. That is, as soon as we had a drink of tea, away we went. We didn't waste any of the time we had before dark . . . We'd have an escort of wild blokes (local people) wanting to know what we were looking for . . .'

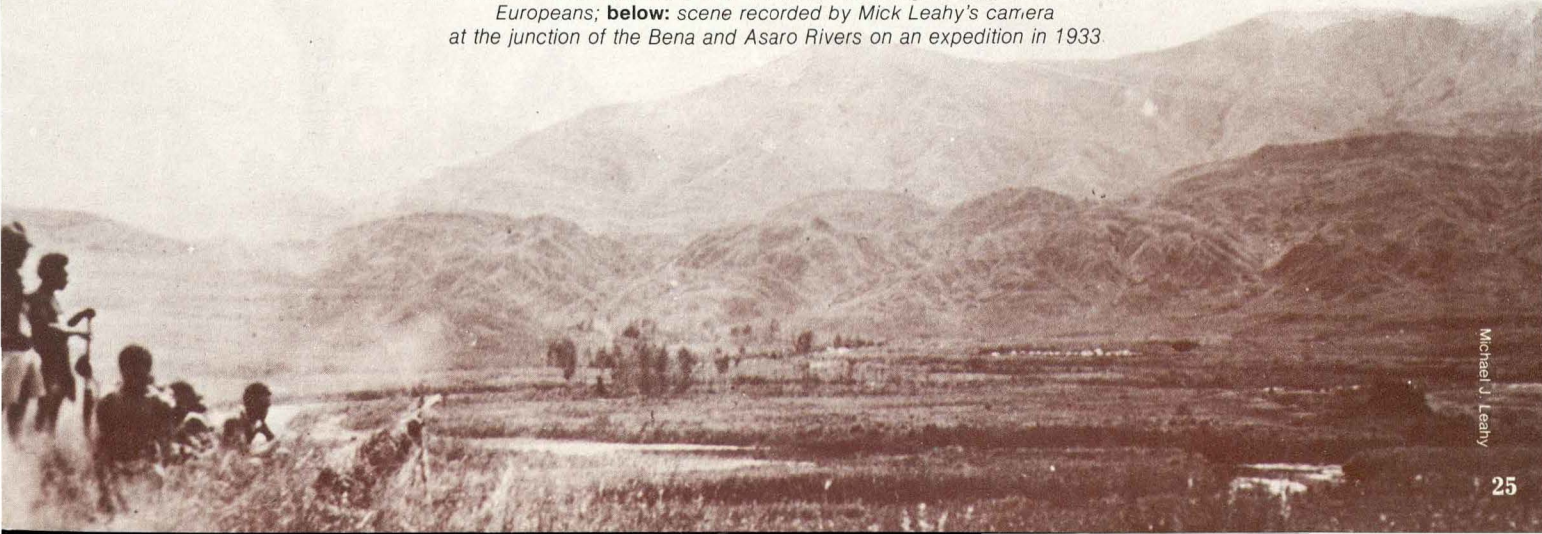
The 'wild blokes' were never far away and the strange activities of the two Europeans fascinated them. Koritoiya Upe of Korofeigu village is still able to point out the site of the prospectors' camp near the Bena River. He remembers too that on one day one of them was sick and stayed in his tent. It was Mick Dwyer suffering from malaria.

On November 5, Leahy wrote: 'Mick has a pretty bad dose of fever so will hang on here until he is okay . . .' Dwyer casually noted about himself: 'Down with fever. Mick prospected the river and I was a cot case.' The two men took two aspirins and five grains of quinine every day but it didn't stop them getting 'a dose of fever now and again'.

Though the Goroka people generally were in good health, Leahy and Dwyer were shocked by the incidence of yaws. Leahy noted: 'There is a good bit of framboesia (yaws) about, one man having his chin attached by pieces of new flesh to his chest. He is not a nice sight by any means.' (Three years later, Leahy arranged for New Guineans working for his company, New Guinea Goldfields, to be treated with shots of neo-salvarsin which produced a quick, almost miraculous cure for yaws. It was a very impressive confirmation of white man's medicine.

Leahy noted that there was 'some very good wash about, suggesting good gold country'. However, the river system continued to puzzle the two men. From Korofeigu, Leahy climb-

Above: *Lufa men examine a 'red' man's boots during an early contact with Europeans;* **below:** *scene recorded by Mick Leahy's camera at the junction of the Bena and Asaro Rivers on an expedition in 1933*



Michael J. Leahy

Below: *Goroka people crowd 10-15 deep around the Leahy-Dwyer camp at Lilihametoka on November 7, 1930;* **right from top:** *the prospectors' 1930 route through the Goroka valley; Sipane Halakue (left), with his family in 1977, remembers the prospectors patting their stomachs to indicate their hunger; Mick Dwyer, back in Goroka in 1979 for the first time in nearly 40 years, with his chief carrier, Ewunga Goiba, and village magistrate Gopie Ataiamelaho (Mick Leahy had died earlier in 1979)*

ed to a low ridge which gave him a view to the northwest. He concluded there must be a gap in the Bismarck Range through which the rivers drained the valley. 'Am pretty sure this stream does not return into the Purari but flows about northwest and will run into the Ramu or Sepik, probably the Ramu,' he speculated.

Next day he was not so sure. And, by Friday November 7, when they reached Asaro, they found the main stream running into the Purari. It was a great disappointment for them both. They now knew that their dream of gold-laden streams dropping in gentle stages to the Ramu was no more than just that. Leahy noted sadly: 'Unless we can find a track over the mountains (this) just about limits our country'.

On November 6, with Dwyer well enough to travel, the party left Korofeigu at 6am. They were accompanied by Korofeigu 'carriers and advisers'. The terrain ahead was well-known to the Korofeigu because they had taken refuge with some Goroka people during inter-clan wars a decade before. They escorted the strangers to within a few kilometres of Goroka where they handed them over, amidst much shouting and gesturing to the next clan.

Leahy recorded that the new people 'were very frightened for a start but got friendly after a bit'. The new village was Seigu, a few kilometres southeast of present-day Goroka.

Gelepat Amelauho, a Seigu 'bik man' (leader) who died in June 1974, remembered the arrival of the prospectors and was able to provide a vivid eye-witness account of events:

'We first heard the Bena men calling out that these strangers were coming. I was a young man . . . old enough to wear a headdress — maybe 25 . . . I wasn't the first person to see them but the shouting soon attracted my attention. They (Leahy and Dwyer) started looking for gold in the creek close to where the bridge now crosses it. They dug with their shovels in the bed of the creek and we had no idea what they were doing. We didn't know if they were from the sky . . . We hadn't seen anything like their skins before. We decided later that the white men could not have been ancestors because our ancestors would have been black . . . They were probably men from the sky. We were very afraid . . . They made their camp a little to the west of here at a place we call Gemelapega.'

At the first news of the *gorohave*, Gelepet recalled, women and children were hidden at a safe place 'far out'. Kirupano, a Seigu councillor, remembers that the prospectors had big dogs, one being 'so savage' his father locked him in the pig house 'so that it would not harm me'. And 'when they lit their Tilley lamp . . . the people thought they had captured . . . the moon . . .'

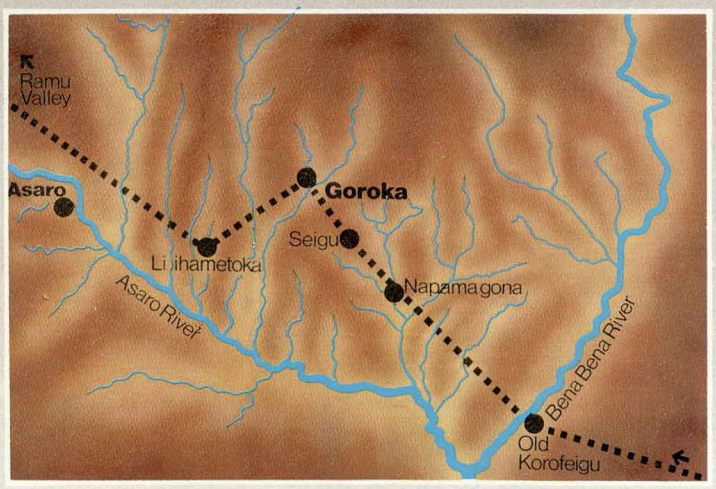
When the initial shock was over, trading began. Gelepet remembers bringing a pig and his friends brought *kaukau* (sweet potato) and sugarcane. Ewunga Goiba, Mick Leahy's head carrier, later described the exchange:

'We bought fowls with *girigiri* (small cowrie shells). One medium-sized or large fowl for one big and one small *girigiri*. Pigs were bought with *kumukumu* (egg cowries), two for one pig. We also used salt, axes, jaws harps and beads for trading. We brought the jaws harps from Salamaua. (They were metal mouth harps sold by Salamaua trade stores.) We even used them as payment for pigs and the people valued them almost as much as shell.'

Another shock was in store for the Seigu people when they saw what could be done with those guns,' said Gelepet. 'We realised at once that they could kill us.'

Mick Leahy commented: 'We always fired a bullet at a tree. In preference we would line up a few shields in front of it and the bullet would go through the shields and then into the tree . . . We didn't want trouble if we could avoid it because once it started you never knew where it would end.'

On November 7 the prospectors rose early and moved off at 5.30am and found they had an 'unusually large escort'. Gelepet related how they took the newcomers across the flat stretch of *kunai* (now Goroka airstrip) 'toward Soso Subi's place' — the ground of the Asarozuha (Asariufa) clan which begins near the Goroka Council chambers and the market. Gelepat said the Asarozuhas took one look at the white men and ran for their lives. The Seigus were traditional enemies of the Asarozuhas, and Gelepet, relating the event, may have been indulging in a bit of bush chauvinism. However, even today, the Asarozuhas and their Okuzuha (Okiufa) allies admit they were very frightened.



Okuzuha men say that the Seigu handed over the strangers shouting: 'Here come the spirits. Be prepared to welcome them.' Ewunga recalls that the people 'thought we were tambarans' (spirits of ancestors). 'The Okuzuha saw the Europeans and thought that they were spirits and that we New Guineans were relations of the Goroka people who had died and had now returned to them. They thought the white spirits were bringing us, the people's dead relatives, to show us again the ground of our ancestors.'

The word 'Makarai', used by the Goroka people on meeting the Europeans, has no traditional useage and I believe it was a corruption of 'Maclay', a word which became synonymous with steel axes and knives which the Russian scientist Miklouchо-Maclay introduced on the Rai Coast near Madang in the 1870s. When the first steel implements were traded they were called 'Maclay' or 'Makarai'. When Leahy and Dwyer arrived as the first white men ever seen in the Goroka Valley, the automatic association was with the legendary 'Makarai'.

Progress from Seigu to the next campsite at Lilihametoka was slow because the prospectors carefully checked every creek which lay across their path. It took six-and-a-half hours to cover 13 kilometres. This gave the Goroka people plenty of time to study their movements.

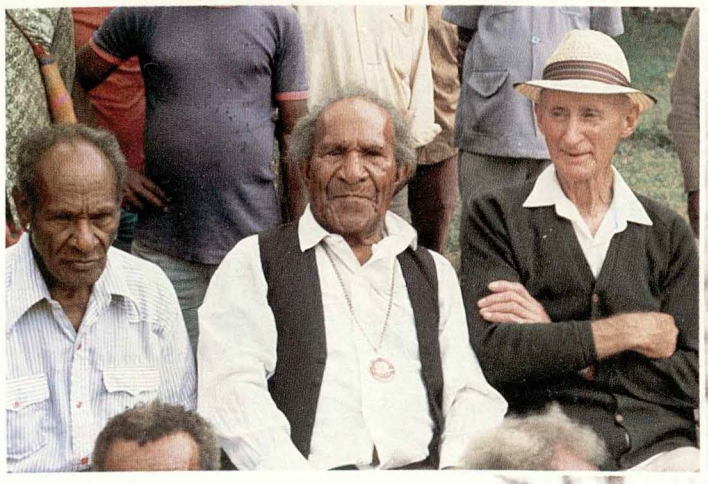
By the time the prospectors made camp at mid-day a huge crowd had gathered and the people were 10 and 15 deep around the fishline fence erected around their tent.

Mick Leahy unpacked his Zeiss Ikon 116 camera and, posing himself and Dwyer in front of the crowd, got one of the carriers to take the picture. Three photographs of this historic occasion have survived in Mick Dwyer's collection. Leahy and Dwyer spent their last day in the Goroka Valley prospecting around Asaro. Leaving their Uheto campsite at Lilihametoka early on November 8 they made their way through Asaroka and Iufi Iufa to Asaro and then made their campsite at Gimsave No 3 village. This is not far from the present-day Roka coffee plantation.

Ewunga Goiba, who now lives in honoured retirement at Roka, said that when the party first entered Asaro territory, warriors surrounded them and threatened to fight. But, said Ewunga, he and Mick Leahy approached the warriors confidently and soon made friends.

Sipane Halakue, now a vil-

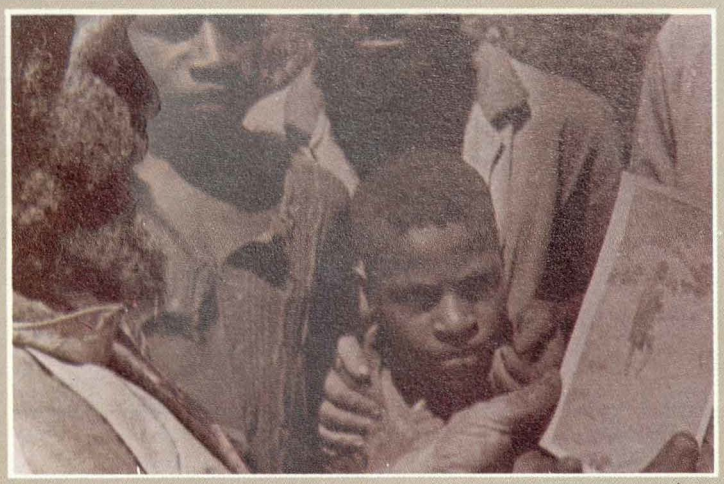
Peter Munster

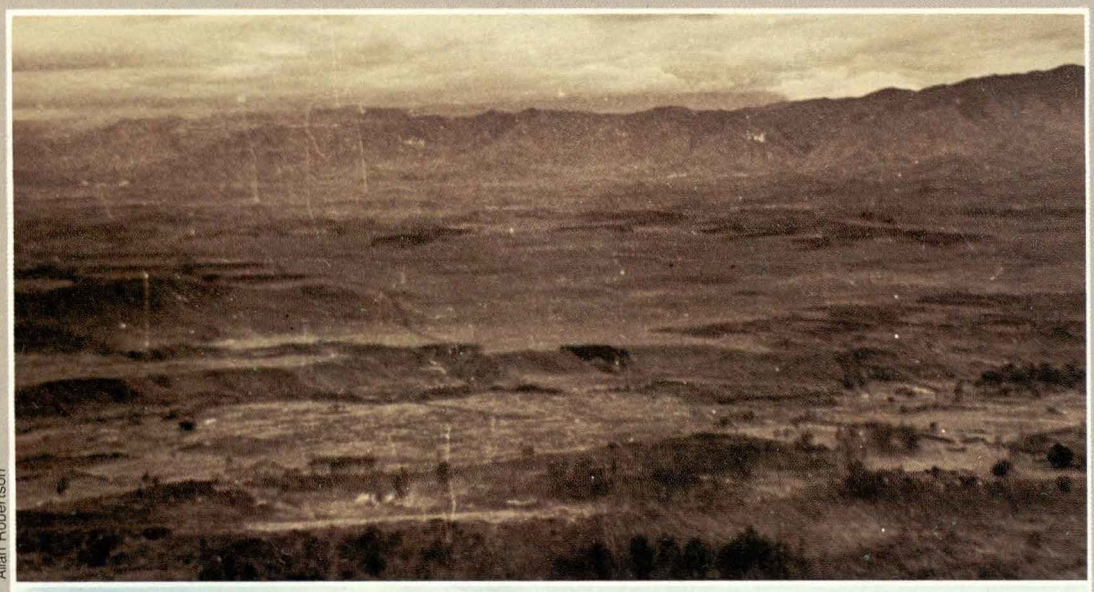


Peter Munster

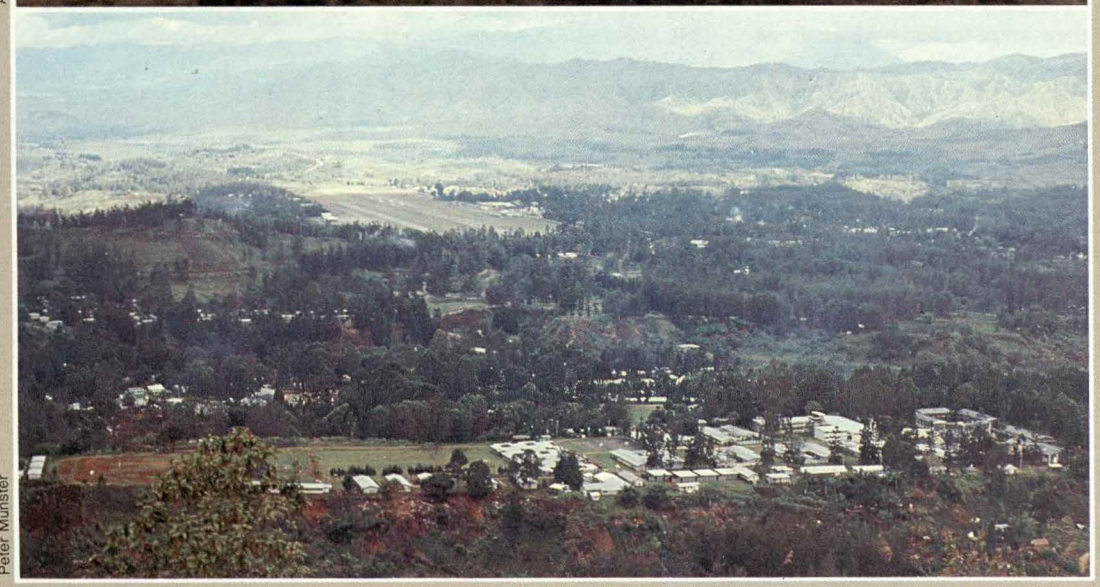
Sipane Halakue thinks he is the long-haired youth Mick Leahy photographed in 1930 (right); **far right:** *Sipane, now an old man, inspects the photograph;* **below and bottom:** *the Goroka valley from Mount Aropega 1940 and 1979*

Michael J. Leahy





Allan Robertson



Peter Munster

lage elder, says: 'I remember they patted their stomachs to show they were hungry so we brought them *kaukau*, corn and sugar cane. In payment they gave us shells — *girigiri*, *kumukumu*, beads and salt. They also gave us a tomahawk which they showed us how to use and very soon we were cutting firewood with it.'

When the villagers produced a large pig, saying 'It is not good that we feed them only on *kaukau*', Mick Leahy promptly shot it to demonstrate the power of his rifle.

Among photographs Mick Leahy took on this expedition was one of a light-skinned youth standing with his back to the camera in a creek to show off his magnificent hair arrangement. His hair was plaited into strips of bark falling down below his buttocks. Sipane believes that it is a picture of himself. 'That could be me,' he says. 'You can see the bark and also the real hair coming down. That time my hair was newly done. It was a bit short. But in another two or three years, after they have kept on putting fat from the pig on it, it gets heavy and the hair pulled longer and longer.'

Mick Leahy observed that some trade was coming in over the high mountain barrier between the valley and the Ramu River so they determined to 'try and break through', having given up hope of finding worthwhile gold.

On one occasion Leahy sank a 'four-foot hole' into the gravel beach of the Asaro but 'could only get very small colours from the bottom'. Sipane said that when 'the white man dug in the river bed he got some shiny stuff and we had an idea it must be valuable'.

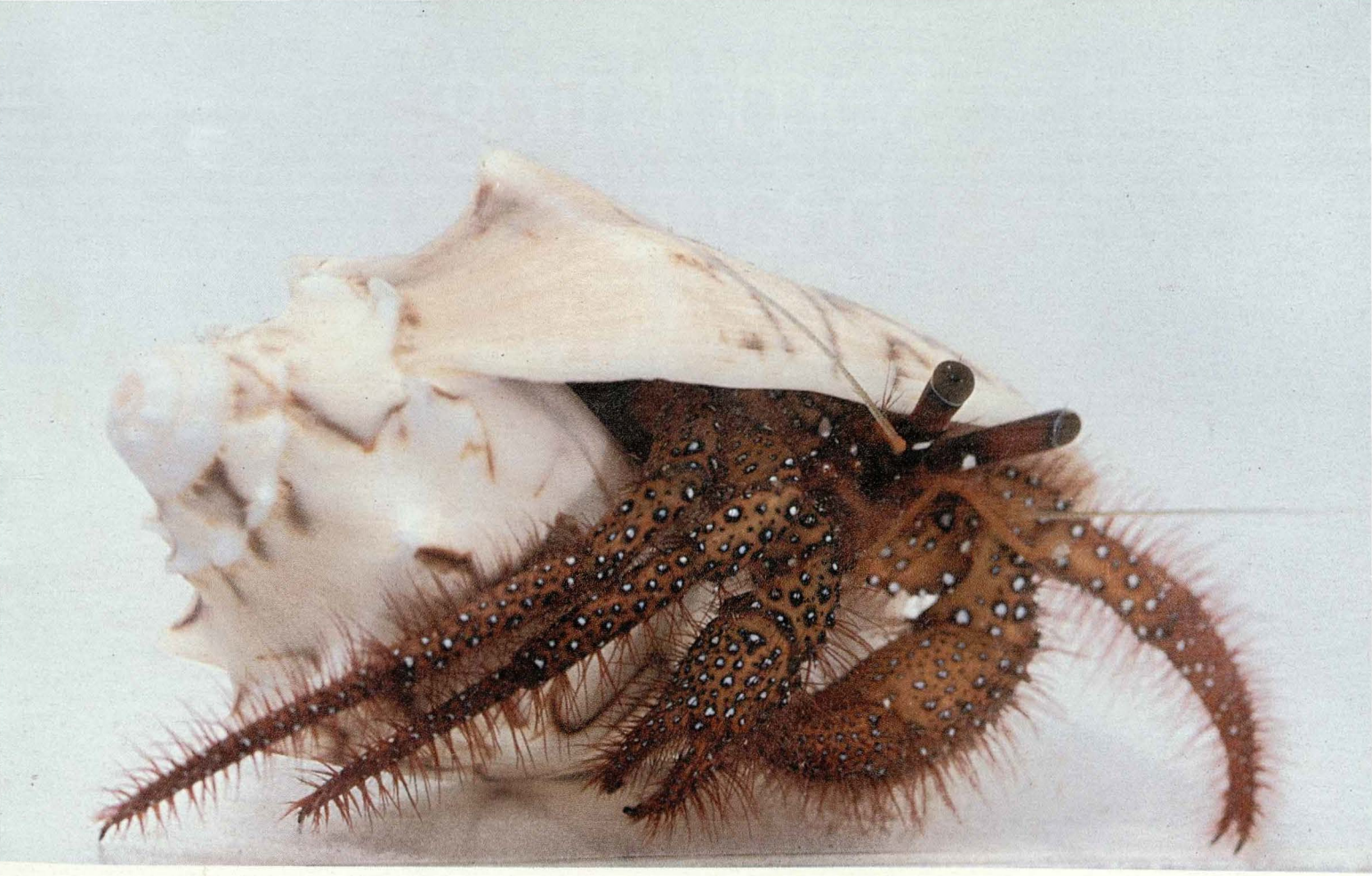
A number of factors made the prospectors give up prospecting the area. For a start, with pure gold at only four pounds sterling an ounce neither was going to make a living. Dwyer was broke and Leahy would have been had not his brother Jim been running a contracting business on the Edie Creek goldfield. The wet season was coming on and supplies were running low.

Mick Dwyer says: 'We decided that nothing would pay and I never dreamed of aeroplanes flying cargo into the Highlands or of people building a road to Goroka, so we just wiped the areas as a no-hoper'.

In 1979, when Mick Dwyer returned to Goroka for the first time in 49 years for the opening of the Leahy wing of the provincial capital's museum, he was welcomed with these words by Gopie Ataiamelaho of the Gama clan:

'A long time ago you came and saw us living a simple life. We had no trucks, no permanent houses, our children did not go to school or university. But now you can see great changes and we are proud of what we have done. What do you think of us now?'

Mick Dwyer was not really expected to reply. The answer was self-evident. — *Peter Munster is an historical research student who lived in the Goroka Valley for nine years*



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INSECT POTTERS

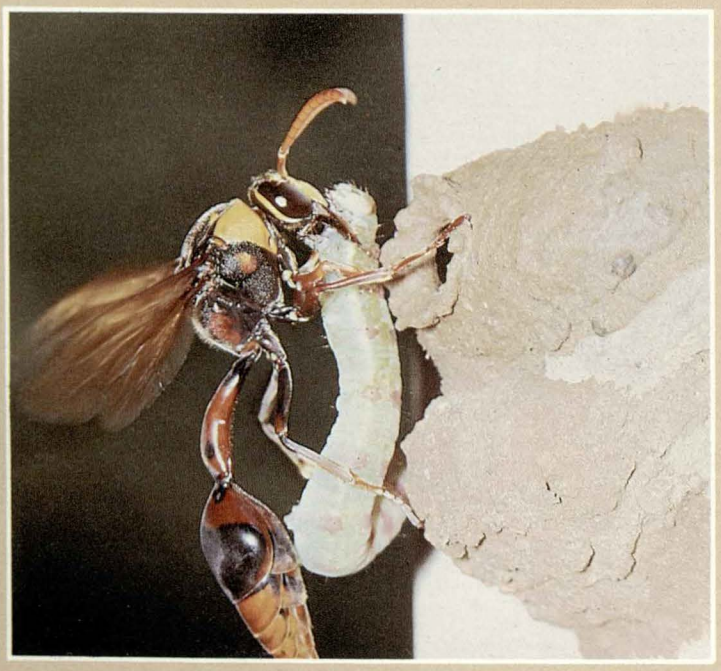
Story and pictures: Philip Spradbery

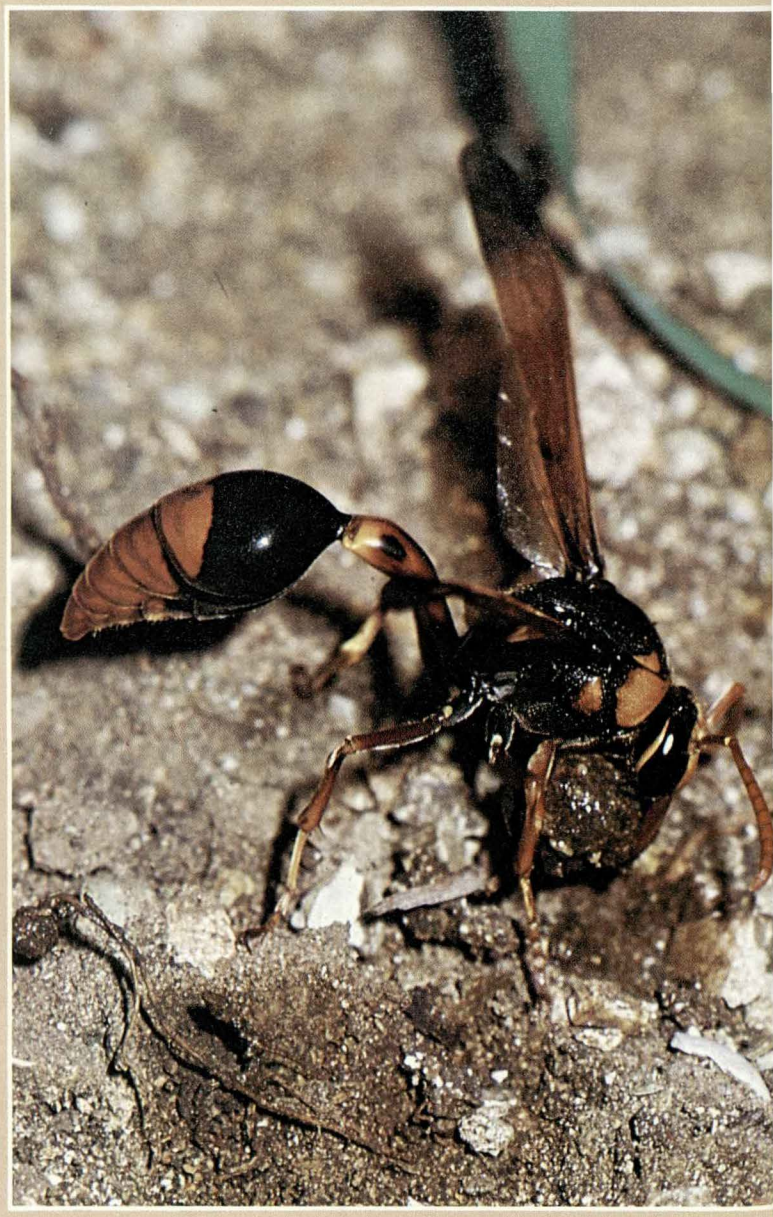
Stenogaster *females rest on the clay cells they are building*

BEFORE humans set foot in New Guinea, clay pots were being fashioned in a rich variety of shapes and styles. The potters were species of wasps. Their ability as potters may come as something of a surprise to those who thought the only thing wasps were good at was stinging.

Most wasps build their nests by digging burrows in the ground or constructing cells of mud in which they bring up their young. Although many species build in mud or clay, few produce the delicate flask-like cells which are typical of the *Eumenes* wasp whose name is derived from the Greek word for 'gracious ones'. Their nests are fixed to branches of trees and shrubs, stone walls and man-made structures such as house timbers, curtains, even books.

The *Stenogaster* — primitive relatives of the *Eumenes* — build their fragile mud cells along the banks of streams in





Above and top: *stocking the larvae's larder;* **above right:** Eumenes *female collects a ball of mud after softening the soil with droplets of water;* **opposite:** *after provisioning the cell with living but paralysed food, the wasp then returns with a ball of clay to seal the entrance, finally putting finishing touches to the completed clay pot*

the rainforests of Papua New Guinea. They feed on midges trapped in spiders' webs which abound in such localities.

Although fixed structures are generally used as sites for wasps' nests, there is a story of a wasp which built its nest on the window pane of a railway passenger carriage in Australia. Though the carriage made several trips in and out of the city each day, the wasp persisted in its building activity every time the train stopped at one suburban station. It finished the nest. Whether it was a successful home for the young is not known.

Once a wasp has selected a site for its nest, it goes off to find water and a patch of bare soil. The water is used to soften the soil during the excavation process. This results in a ball of mud being produced which is then carried back to the nest site.

When construction has begun, the wasp works with ferocious energy. It flies to and fro, without resting, until a cell is complete. The wasp then extends the tip of its abdomen and places it through the narrow opening to the cell and lays an egg. The egg is suspended by a fragile thread from the roof of the cell.

Then begins the task of provisioning the new home with

food. The *Eumenes* wasp feeds its young on small caterpillars although other food, such as beetle grubs and spiders, are used by other wasps.

Hunting among the foliage of trees and shrubs, the wasp grabs a caterpillar with jaws and legs, quickly jabbing its sting into the victim's body, injecting a paralysing venom. This keeps the food alive, thus ensuring a supply of fresh food for the young wasp.

The wasp carries its victims back to the nest slung beneath its body like a fighter plane carrying an air-to-air missile. It then pushes them through the narrow cell opening before flying off in search of more food. Five to 10 caterpillars are required to provision a cell, the number depending on the size of the victims. When the cell is packed, the wasp flies off to get a final few loads of mud to seal the entrance.

Usually several cells are built at the same site and, when the cluster of pots is complete, the wasp frequently adds camouflage by daubing mud over them so that the whole structure looks like a large blob of clay. Some *Eumenes* wasps even use plant materials found at the nest site. They stick it over the structure to make it virtually indistinguishable from its surroundings.

The wasp egg hatches after only a few days and the grub-like larva begins feeding on the preserved caterpillars until they are all eaten. Then the larva spins a silken cocoon within which it changes into an adult wasp.

When large numbers of cells are built on top of each other, or end to end, young adults are faced with the problem of chewing their way out. To help synchronise each cell's development, the wasp has evolved a system whereby it makes the first cells (which may be completed several days before the last) bigger, lays female eggs in them and stocks them with more food. Females, needing more food, take longer to feed

From top: Eumenes *female inspects the inside of a new cell; pushing the tip of its abdomen into the cell to lay an egg; cross-section of cell showing egg, suspended from roof, and paralysed caterpillars*

and therefore are ready to emerge about the same time as the smaller males which feed on fewer caterpillars in the smaller cells.

When the female wasps begin chewing their way out of the cell walls, the rasping noises they make act as a signal for the wasp next door to begin to cut its own way out. This communication makes for an orderly evacuation of the nest.

The parent wasp which nests in the hollow stem of plants leaves a coded message for her offspring. The end of the cell furthest from the opening of the stem is made concave and smooth while the plug which seals the cell is rough and irregular. When the time comes for the young wasp to leave the nest, it can detect the difference in texture of the cell walls and always leaves via the rough end.

Although the potter wasp stings its prey, it is not aggressive and its sting is not well adapted to pierce human skin. If it should manage to sting you, however, the effects are very mild compared with stings of bees or hornets.

Because potter wasps provision their nests with caterpillars — many of which otherwise would damage the crops and flowers in our gardens — they are useful to us. So, next time you see a wasp building or provisioning its clay pot, don't destroy its nest. Just stand back and admire its artistry and industry. — *Dr Philip Spradbery is a Senior Principal Research Scientist with the CSIRO (Commonwealth Scientific and Industrial Research Organisation of Australia) in Port Moresby. He is author of a standard reference book on wasps published by Sidgwick and Jackson, London.*

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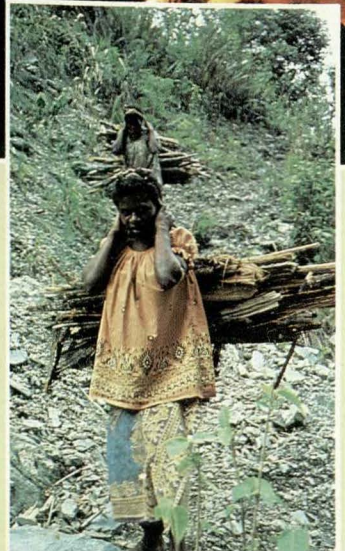


From top: *harvesting the first crop to mature; planting with traditional digging stick; burning trees for a new garden on Mount Kaindi, Morobe Province; bringing firewood home from the new garden*

GARDENERS ON THE MOVE

Story and pictures: John Swift

'DIWAI,' yells the villager, and a forest giant crashes to the ground. Nowadays, cutting timber (*diwai*) to clear forest gardens is a much speedier process. In times before the introduction of steel implements it sometimes would take several men as much as a week to fell one tree with their stone cutting tools.

More than three quarters of the people of Papua New Guinea practice shifting cultivation though pressure from an increasing population is having a detrimental effect on a previously balanced environment.

Forest farmers have an intimate knowledge of the resources available to them. They know that the best garden sites are on the floor of the rainforest where the rich humic soil is high in organic matter and nutrients which will promote vigorous growth.

Picking the right tree to fell was an art in the days of stone tools. Gardeners could save themselves a lot of work by ensuring that the tree which they slaved so long to topple would fall in such a direction that it would take others with it. A good farmer could clear up to 20 trees in the falling path of the one cut. Ring-barking and lighting fires at the base of hardwood trees are other clearing methods used by shifting cultivators.

Many farmers prefer to garden on steep slopes because this gives good drainage in the wet season.

Typically, a farmer will clear a large area of forest and then divide the site into sections, using bamboo or logs. He then permits family members or people to whom he owes favours to garden these sections for themselves.

Planting and harvesting is a group activity involving many people. The whole family often helps with the first planting — the men and boys planting yams, the women everything else. In areas where wild pigs roam, intricate fences are built to keep them out.

Before planting the farmers burn the fallen trees, thus providing a warm ash instead of waiting for the leaf litter to decompose naturally. Then a heavy digging stick, cut from a particular species of trees, is used to loosen the ground prior to planting.

Taros and yams, favoured foods, require good soil if they are to produce large tubers, so these crops, traditionally, are planted first. Between these staple root crops the women plant a wide variety of *kumu* (leafy vegetables).

A garden may last several years. Six months after planting, farmers begin to harvest taros and yams. This process can go on for as long as six months. *Kaukau* (sweet potato) is then planted in the harvested taro and yam beds.

Gardeners keep their plots well weeded for the first eight months or so by which time secondary growth seedlings begin rapid growth. Weeding is then abandoned and the forest begins to reclaim the site. It is in this

period that crops such as bananas, pawpaws and sugarcane come into their own and these are harvested toward the end of the garden's useful life.

Then the jungle reclaims its own and the site will not be used again at least for 15 years during which time soil fertility is restored.

Forests contain a remarkable variety of plant species which the farmer has learned to use. The bark of some species — such as tulip trees — after drying, is used to make *bilum* (carry bags).

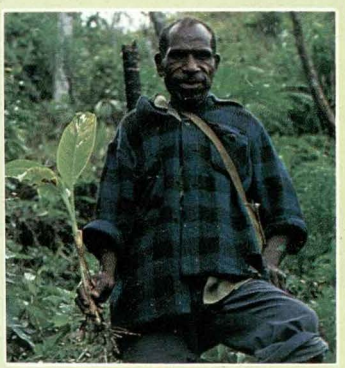
The young leaves of trees such as the Ficus species make nutritious greens and go well with a feed of sweet potato.

The sticky sap of the Homolanthus trees makes a strong glue which can be used for attaching cuscus skin on drums. Other trees, like the pandanus, have edible nuts and fruit.

There is a tree known as the Fermiana papuana which is ring-barked and allowed to remain standing in a garden area. It becomes the dead host to thousands of white grubs which, cooked, are regarded as a delicacy.

Many trees have recognised medicinal properties and, of course, the timbers obtained during clearing are used for building and firewood.

As the cash economy encroaches upon Papua New Guineans, the shifting cultivation system is experiencing change. Increasing population pressure, shortening of fallow periods and uncontrolled fires are converting old garden sites into open grassland. Ultimately, this process will pose a serious threat to the viability of forest gardening. — *John Swift is a member of the Wau Ecology Institute in Morobe Province.*



Top: *Morobe forests from Mount Kaindi;* **above:** *forest farmer with regrowth seedling;* **left:** Ficus *tree whose leaves and fruits can be eaten*

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