

ARCHAEOLOGY AND ROCK ART AT CHILLAGOE (AUSTRALIA) A PREHISTORY OF WAGAMAN COUNTRY

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Chillagoe holds a special place in Australian archaeology. Its links with the discipline were formed long before any archaeological work was ever undertaken there, when in June 1892 Robert Broom accepted a post as resident medical officer in the Chillagoe District Hospital. He spent eleven months at Chillagoe, often occupying himself by collecting fossils from the local limestone outcrops. Failing to make any major discoveries, Broom later moved south to New South Wales, subsequently accepting a post at the Transvaal Museum in South Africa (Robinson 1983). It was in this capacity that he became interested in the fossil caves at Swartkrans and Sterkfontein, where he discovered the first signs of *Australopithecus africanus* ('southern ape from Africa'). These were, at the time, the oldest known hominids in the world, and continue to this day to be a major source of scientific debate on human origins (perhaps best popularised by the writings of the Leaky family and Donald Johanson) (see Leaky and Lewin 1991; Johanson and Shreeve 1991).

Broom's associations with Chillagoe were limited and, as far as we know, he did not attempt any archaeological excavations in the area. It would be another seventy years before the first signs of such research were to emerge.

In 1963, Dr. Richard Wright, a graduate from Cambridge University, undertook exploratory excavations in an un-named rockshelter near Chillagoe. Unfortunately, Wright's excavations were shallow and did not produce sufficient charcoal to enable him to obtain a radiocarbon date for the site; to this day it remains undated, unanalysed and largely unpublished. Wright moved on to the east (Davies Creek) and to the north (Laura) in search of better pastures, leaving Chillagoe for future researchers (Wright 1971).

No archaeological work was undertaken at Chillagoe during the next seventeen years. When such research did begin again, however, it was to be the commencement of the first major long-term archaeological project in the region. This new research signalled the beginnings of a new era of scientific archaeology in tropical northeastern Australia. It began in 1980, when John Campbell, of James Cook University (Townsville), initiated long-term research in a spectacular rockshelter south of Chillagoe. His excavations led to a number of new research projects, some of which will be summarised in later sections of this booklet.

Campbell's findings were important and stimulated the interest of many young researchers (including that of the authors). Since 1980, over a dozen research projects have focused on the archaeology of Chillagoe, although many of these still await publication. A number of us who began our careers at Chillagoe have since gone on to other archaeological projects in Australia and beyond. Yet, despite the considerable research that has been undertaken in and around Chillagoe, it has never been presented in an accessible format, nor has it ever been synthesised into a *regional* prehistory. This booklet was thus written for two main reasons. Firstly, as a measure of thanks to the people of Chillagoe for their continued support during the course of our research; and secondly, to give visitors to Chillagoe some information about the archaeological work that has been done there. In presenting these archaeological results, our aims are therefore not so much to give an account of the prehistory of the region, but, rather, to show *how* we have constructed such a prehistory. We are firmly of the opinion that academic research should not be isolated from the broader public. Most people are interested in the findings of scientific work and therefore researchers (archaeologists included) have an obligation to communicate their findings with the public. This has been made particularly obvious to us when visitors to

Chillagoe would repeatedly ask for information about the Aboriginal prehistory of the region. In most cases, there was little appropriate reading material to direct them to. This was unfortunate as visitors would often leave the area with little understanding of the archaeological sites they had seen. This booklet is thus aimed at enhancing people's experiences of the public rock art sites at Chillagoe and nearby Mungana, by offering a detailed outline of what we know of the Aboriginal prehistory of Chillagoe.

Having said this, we have also had to face a dilemma. The vast majority of archaeological sites in the Chillagoe region have either never been studied, or are currently undergoing intense investigation. All of these sites are very fragile. Foot traffic on the soft floors of caves can cause damage, while the rock art on the walls and other indicators of human activity are also particularly susceptible to damage. The rock art itself is, in many cases, slowly weathering away. The mere touch of a painted rock surface by human hands may at times initiate irreversible chemical reactions on the cave wall, leading to the rapid deterioration of the art. Because of this, visitors to the region should be careful of where they tread, and should always avoid touching cave paintings and other archaeological materials.

In undertaking our research at Chillagoe, we have received support and encouragement from many individuals and organisations. In particular, we thank the people of Chillagoe for their help and hospitality. The individuals are too many to list in full, but we would especially like to thank Daphne Brumby, Dave Currie, Annette Davis, Maree David, Johnny Fred, William Johnson, Gaylyn Keats, Lana and Tony Little, Rita Maddigan, Mick Moylan, Myrene Rodgers and Mike Rowland for their help and companionship. The Australian National University, the Australian Institute of Aboriginal and Torres Strait Islander Studies, the Australian Heritage

Commission, the University of Queensland, the Chillagoe Caving Club, and the Chillagoe office of the Queensland National Parks and Wildlife Service have also offered invaluable support during our research at Chillagoe. To them all we extend our thanks.

INTRODUCTION

The Chillagoe limestone belt is one of Australia's spectacular geological formations (Figs 1-2). It is situated in the tropical north, some 140km west of Cairns, stretching from the Walsh River in the north to Ootah in the south (Fig. 3). The limestone outcrops in karst towers (bluffs), which often exceed 300m in length (Fig. 4). These karsts jut out of the surrounding landscape as rugged peaks, reaching up to 100m in height (Fig. 5). The maximum width of the exposed formation is 11km, some 5km south of Chillagoe. This is a highly localised geological phenomenon, restricted to the western slopes of Australia's Great Dividing Range, a coastal-fringing mountain belt that traverses the entire eastern side of Australia from north to south.

The Chillagoe limestone belt was laid-down during the Upper Silurian and Lower Devonian (420-360 million years ago) in a shallow reef environment, at a time when the coastline was situated some 130km west of its present location (de Keyser and Wolff 1964). Subsequent episodes of uplift, volcanic eruptions and tectonic activity, coupled with erosional events caused by the action of wind and water, has given Chillagoe its unique characteristics. Many of these events took place before the Great Dividing Range was formed, an indication of the long period of time that has elapsed since the limestone was first laid-down by marine organisms.

CHILLAGOE AS A HUMANISED LANDSCAPE

Visitors to north Queensland, and to Cape York Peninsula in particular, often think of the local landscape as 'pristine', untouched by human hands and representing one of the last 'wilderness' areas in Australia. However, if we wish to understand anything about the (pre)history of Aboriginal occupation in the region, we must begin by rethinking these

preconceptions. Chillagoe, like the rest of Australia, is a *humanised* landscape. It is not, as many people believe, a wilderness area. It has not been for at least 40,000 years, a 'wilderness' area. Rather, it has been the homeland of countless generations of Aboriginal people, each of which has viewed the landscape through their own social and individual lenses. The physical landscape has itself been modified by Aboriginal practices, including what Dr. Rhys Jones has called 'fire-stick farming' - the practice of repeatedly burning the landscape, to enhance the growth of young shoots, clear old and thin grassy areas to facilitate travel, and so on. Such practices have resulted in widespread environmental changes throughout Australia, including alterations in sedimentation regimes, increasing slope instability, and the establishment of fire-resistant vegetation communities. To this day, Cape York Peninsula continues to be an area affected by human occupation, even though it may be very difficult to pin-point the specific influences that people may have had on any given locality.

But Chillagoe, and the Australian landscape in general, should be recognised as a human landscape for an even more fundamental reason. In living in and using the area, people interpret and, in a sense, *create* the landscape in their own minds. When Europeans first arrived in the area, they saw vast plains and grasslands ideal for cattle grazing. The river-beds were rich in gold and other minerals, promising just rewards for anyone willing to exploit them. In such ways, the land was viewed through their own political, social, religious and economic frameworks. It had to be worked, and individual blocks of land were fenced-off in order to mark and 'protect' one's own ground. This represents, in part, the way most 'recent' arrivals to Chillagoe have tended to use and perceive the local landscape.

But the land was humanised by Aboriginal people in a very different way. Later

articulates the Dreaming itself, and it illustrates the principles that give meaning and form to the world. We use the word Dreaming here, rather than *Dreamtime*, with good reason. The latter implies a linear framework of time, which begins with a past era when the world was created via the activities of 'spirits' and ancestral beings. Such a characterisation by-passes the very essentials of the Dreaming, which links the past, present and future in a non-linear way. The Dreaming refers to the creation of the world by essences that exist in the past, present and in the future. The Law is established in the Dreaming, creating a blue-print for human behaviour, as well as defining the means by which transgressions can be addressed. This period of creation cannot be seen simply as something of the past, for the Dreaming continues to define the landscape today, as well as people's relations with it. A glimpse of this can be seen at Ngarrabullgan, to the east of Chillagoe, where Francis Richards recorded the following details earlier this century (Richards 1926, p. 256) (Fig. 6):

[The local people] had an intense fear of devils. There were four of these -

- (1) The Beerroo, who lived anywhere.
- (2) The Eekoo (or mountain devil), who lived on Mount Mulligan.
- (3&4) Mooramully, Barmboo - Water devils inhabiting waterholes.

Most sickness was attributed to the agency of these devils, the blame generally falling on the Beerroo or the Eekoo. These devils were able to throw hooks, stones, or pieces of wood into the body without leaving a mark. The Eekoo's home was a lake on Mount Mulligan (Lake Koongirra), and natives were very afraid to go near this lake or into its waters; though the Rhoonyoo (or witch doctor), being a companion of the Eekoo, could enter the water without fear. The Eekoo was generally held responsible for any sickness when on the mountain. The natives have an interesting legend to account for the origin of Mount Mulligan and its lake. The mountain, which was built by wallabies on the advice of the eaglehawk, was originally a huge pile of stones. A swamp pheasant built its nest on the mountain

and hatched its young. The Eekoo came along and killed the nestlings. The pheasants in their anger thereupon started a bush fire to burn Eekoo, and so great was this conflagration that it melted the stones and so formed the towering cliffs of Mount Mulligan. To save his life the Eekoo created the lake and took refuge in its waters; and so the lake became his home. Although the lake is the home of the Eekoo, strictly speaking he is not a water devil but wanders about anywhere on the mountain.

Hence the landscape itself is attributed meaning through the Dreaming, and individual features of this landscape - such as Ngarrabullgan - are imbued with meaning and perceived through this framework.

In Aboriginal Australia, people's relationship with the land is defined by many things including the ways in which each individual is related to the Dreaming beings and events which give meaning to the landscape. A person of a certain clan has specific obligations to particular places. Each person can use the land - to gather and hunt resources, visit people and so forth - only within the context of the Law. That is, behavioural rules have to be followed in all places. Individuals know by virtue of their links to the land, to other people, and to the Dreaming, which behaviours are appropriate and which are not, for any given place and context. In this way, the land is humanised. It is important to note at this stage that Aboriginal people in Cape York Peninsula have retained a deep sense of place for their traditional lands and waters, a sense of place that is rarely appreciated by non-Aboriginal Australians.

THE CHILLAGOE ABORIGINAL COMMUNITY

Little is known about Aboriginal life at Chillagoe during the early years of contact. In other parts of north Queensland, early observers (including anthropologists) often commented on the lifeways and beliefs of different social groups, but this has not happened at Chillagoe.

Consequently, our knowledge of the details of pre-contact Aboriginal culture in the region is limited, and relies largely on archaeological evidence. Being manifest in the *material* record, however, the archaeological evidence does not offer much information on such things as belief systems, religion, kinship networks and the like.

Nevertheless, we do know that Chillagoe is part of Wagaman country. Wagaman is a language group whose territory stretches approximately from Chillagoe (NE) to Dagworth (SW). Members of the Wagaman community have long been closely allied with the Kuku Djungan community to the immediate east, as well as with people to the west and south. It is important to note that the archaeological information presented in the following pages concerns the heritage of the Wagaman people of today, and we are grateful to them for allowing us to research their history and to publish it here. Many of the places mentioned in this booklet continue to have significance to many Wagaman people, and visitors to the area should keep this in mind when visiting Aboriginal sites.

BACKGROUND TO ARCHAEOLOGICAL RESEARCH

Prehistory is, technically speaking, the history of societies without writing. Australian prehistory begins at least 40,000 years ago (quite likely sometime between 50,000 and 60,000 years ago) and continued until the arrival of Europeans. The earliest radiocarbon dates for Aboriginal occupation anywhere in Australia come from a cave situated near Ngarrabullgan (Mt. Mulligan) east of Chillagoe (Ngarrabullgan Cave) (Fig. 7), and also from archaeological materials found in a river terrace near the Upper Swan River, Western Australia. Both of these sites have evidence of human occupation beginning at least 37,000 years ago. Ngarrabullgan Cave is still

being analysed, and may yet prove to be much older than this.

One problem with radiocarbon dating is that it does not reliably date anything older than about 37,000 years old. Therefore, radiocarbon dating is not particularly well suited to dating very old materials. Some researchers have resorted to using a new technique - optical stimulated luminescence (OSL) - to date older materials (Fig. 8). This technique is based on the energy stored in silica crystals or feldspars inside the soil after they are buried in the ground, and thus hidden from sunlight. By releasing this energy in the laboratory, scientists can determine the antiquity of the layers that contained the crystals. We can thus determine the age of *stratigraphic levels* that contain archaeological materials, using this technique. At present OSL dating is still largely in its experimental stage, having been tested at two caves in Arnhem Land (Northern Territory). Sediments possessing stone tools and other cultural materials at sites known as Malakunanja 2 and Nauwalabila, have both been dated by OSL to sometime between 53,000 and 60,000 years old. Drs. Bert Roberts and Rhys Jones (Australian National University, Canberra) have, on the basis of this technique, argued that Aboriginal people have been in Australia for over 50,000 years.

The Environmental Background

Any investigation of human prehistory must place the archaeological record within a broader environmental context. Australia's climatic history has not remained static, and therefore the study of prehistory should be accompanied by an investigation of ancient environments (palaeo-environments).

The most dramatic environmental changes to have occurred during the last 60,000 years

took place during the peak of the last ice age, which is dated from around 22,000 to 17,000 years ago. This was a period when large quantities of the earth's oceanic waters were locked-up in the polar ice caps. Sea levels were lower and temperatures were colder than they are today (by a few degrees). As a result, the eastern and northern continental shelves of Australia were exposed so that Papua New Guinea, mainland Australia and Tasmania were all joined into a single land-mass called Sahul. Similarly, the islands of Indonesia were also linked together, forming the peninsula of Sunda. Sunda and Sahul were not joined together at the time of the arrival of humans in Australia. A series of oceanic corridors separated the two, the largest of which was some 90km wide during the height of the last ice age. It is from Sunda, probably during a period of relatively low sea levels (when oceanic crossings were relatively short), that the ancestors of today's Aboriginal people came to Australia.

In north America and Europe, a major effect of the last ice age was the development of extensive ice sheets over previously exposed ground. However, in Australia glacial conditions were not widespread - being limited to parts of Tasmania and the southeastern highlands. The major changes witnessed on the Australian continent during this time was an increase in the aridity of all regions, including an outward expansion of Australia's arid core. In many places (such as the Atherton Tablelands) rainforest communities contracted and even disappeared. It was not until after 17,000 years ago, following the period of peak aridity, that environmental conditions slowly began to take a new turn. By around 8,000 years ago, sea levels had risen to such an extent that Papua New Guinea and Australia became separated. Rainfall levels slowly increased after 17,000 years ago, so that by 8000 years ago they were ever greater than they are today. Around 3000 years ago, climatic and other environmental conditions became similar to

what they are today, and have remained largely unchanged since then.

The archaeological record of the Chillagoe region has to be understood within this environmental context because people are continually interacting within their environmental circumstances. There are many ways in which people could respond to different climatic conditions. Therefore, analyses of the archaeological record should aim to discover the nature of *social* conditions which have led to particular types of behaviour, rather than simply assume that human responses were 'adaptive' to environmental circumstances.

Archaeologically speaking, Chillagoe possesses a wealth of information. Archaeological sites - the remains of ancient camping places and other places showing evidence of human presence - are very common. The most dramatic sites are the caves and rockshelters where people made stone tools, camped, painted and so on. In addition to the site excavated by Wright in 1963, four other rockshelters have been excavated in the vicinity of Chillagoe. Together, they have enabled us to look into prehistoric Aboriginal life in the region.

Walkunder Arch Cave

Excavations at Walkunder Arch Cave began in 1980. Dr. John Campbell (James Cook University, Townsville) found a series of layers dating to the last 3,700 years or so, preceded by at least another 11,000 years of human occupation. The deeper, and therefore older layers were not well differentiated, meaning that it has not been possible to undertake a fine-grained analysis of individual occupational events prior to 3,700 years ago. Nevertheless, we do know that Aboriginal people first started living at Walkunder Arch Cave shortly after the end of the last ice age. The earliest reliable evidence for this is dated to $15,950 \pm 770$ years ago, although two le

secure radiocarbon dates suggest that occupation may have begun some 2000 years earlier still (Campbell and Mardaga-Campbell 1993). In either case, the radiocarbon determinations imply that human occupation at the site began after the peak of the arid period, when surface water availability was on the increase. This may have been an important factor influencing occupation at Walkunder Arch Cave, as there are no known permanent water sources in the immediate vicinity of the site (Fig. 9). During the last glacial maximum, Chillagoe was situated on the edge of the semi-arid zone. It is therefore possible that people were largely dependent on a limited number of water sources at that time. If this was so, we could expect archaeological sites dating to this period of time to be largely limited to those in close proximity to water sources, such as springs and major river systems. Although this issue has not yet been fully addressed, another archaeological site excavated from this period of time (Fern Cave) does give the idea some support (see below).

The early levels at Walkunder Arch Cave have not yet been published, so it is not yet possible to say much about the earliest occupation of the site. Instead, more is known about the last 3,700 years of occupation at the cave (see also the section on rock art below).

The upper units, covering a period known as the late Holocene, contain large amounts of charcoal, bone and stone artefacts (the Holocene is a geological term that covers the period following the last ice age - it is commonly treated as spanning the last 10,000 years). During this time, large numbers of hearths (fireplaces) were constructed within the cave. Some of these consisted of small, surface fires, while others were earth ovens dug into the ground (Campbell and Mardaga-Campbell 1993). New types of stone artefacts also began to appear in the late Holocene, although the precise nature of this change has not yet been reported by the excavators.

After 2,200 years ago, the characteristics of stone artefacts began to change once again, with a decrease in the proportions of retouched stone tools. Campbell has referred to this latest phase as the 'Lesser Retouched Tradition' (Campbell 1984).

Within this context of change and stability in the stone tool kit, information has been gained on prehistoric hunting behaviour around Walkunder Arch Cave. The animal bones discarded within the site indicate that most of the hunted fauna came from the limestone zone. Animals from the riverine environments nearby were also exploited (e.g. mussel shells and other aquatic species) but they did not appear to form a major food resource at Walkunder Arch Cave. The hills and plains surrounding the limestone bluffs seem to have been exploited to an even lesser extent, as is evident by the rarity of animal remains from those zones (e.g. wallaroos [*Macropus robustus*] and antilopine wallaroos [*Macropus antilopinus*]). This is particularly surprising, as wallaroos (a type of kangaroo) are the largest and one of the most prolific species currently inhabiting the region. Instead, rock wallabies (*Petrogale* sp.) and bandicoots (*Isodon* sp.), commonly found in the limestone zone, appear to have been especially targeted. Interestingly, 41 of the 43 rock wallabies excavated from the late Holocene layers at Walkunder Arch Cave were of relatively old animals. We know this because they had their fourth molars partially or fully erupted, a phenomenon that occurs relatively late in a rock wallaby's life. This large proportion of older wallabies does not reflect the age structure of *Petrogale* populations in the wild, and therefore it can be said that older wallabies were selectively hunted by the prehistoric occupants of Walkunder Arch Cave. In other words, coupled with a well-defined targeting of the fauna of limestone karsts and adjacent habitats, the late Holocene foragers of the Chillagoe region appear to have concentrated their hunting activities on a specific part of the rock

wallaby population.

We do not yet know why this was so. It could be that rock wallabies were particularly good to eat, and therefore a favoured food item, although in some parts of Australia rock wallaby meat is often said to be rather tough. It could also be that the older rock wallabies were the slowest, and therefore the easiest to catch. Additionally, it is worthwhile considering an alternative explanation - by ignoring the younger rock wallabies, the rock wallaby population could be maintained, ensuring their survival for the future. If this is so, then this hunting strategy, practiced by the residents of Walkunder Arch Cave since at least 3700 years ago, would be one of the oldest conservation strategies yet documented on the Australian continent.

As already noted, the information published on the Walkunder Arch Cave excavations has so far been minimal. This considerably limits our ability to model the dynamics of site use in prehistory. Nevertheless, when viewed in a broader, regional context, we find that the archaeological trends emerging from Walkunder Arch Cave are similar to those found at other sites in the region. We will discuss these trends in more detail below, following a description of the other sites excavated.

The Rock Art of Walkunder Arch Cave

The rock art of Walkunder Arch Cave is in many ways typical of the Chillagoe region, although it also possesses some motif types rarely seen in other sites. Cave paintings are common, with the dominant forms being abstract figures. Alan Watchman and Liz Hatte, two rock art experts working with John Campbell and Mireille Mardaga-Campbell at Walkunder Arch Cave, have managed to undertake radiocarbon dating of some of the art at the site. They have

so far obtained two dates, the first being from oxalates (organic carbons) sealed immediately in the rock over a pecked 'star-burst'. After peckings are created, organic and inorganic compounds accumulate over them. By obtaining a radiocarbon date for material over an engraving, it is possible to obtain minimum dates for the creation of a figure. Following this logic, Watchman and Hatte obtained a date of 7085 ± 135 years BP (before present) for the oxalates above the 'star-burst'. The implication is that the engraving is probably older than this.

The second radiocarbon date obtained for rock art at Walkunder Arch Cave comes from underneath a painting of a red human. The date obtained was 9470 ± 120 years BP, indicating that the painting is younger than this date. However, yellow and white pigments were noted in the rock crust, at a level underneath the radiocarbon date, indicating that there were once older paintings there. The results of these investigations have not yet been fully published, and their broader implications have therefore not yet been explored (Watchman and Hatte in prep., cited in Campbell and Mardaga-Campbell 1993:59).

Fern Cave

Fern Cave is a deep cave perched above the pediments of a large limestone bluff to the north of Chillagoe. It overlooks a seasonal creek bordered by vine thickets some 30m beneath it. Fern Cave contains two high, domed chambers, the floors of which cover an area over 1000m^2 (Figs 10-12).

The entrance of Fern Cave involves a steep climb up boulder-strewn pediments, giving way to a large cavernous opening. Numerous large boulders at the cave mouth act as a sediment trap, so that wind-borne dust particles are caught among the rocks, accumulating outside, rather

than inside, the cave entrance. Today, you can hear water occasionally dripping from the ceiling of the cave. On a hot day, Fern Cave offers a cool, refreshing change from the outside heat.

In 1985 one of the authors (David) undertook test excavations inside the entrance chamber of Fern Cave (Figs 13-14). The reason for excavating at the site was that it contained some very weathered engravings, which seemed to indicate that people had visited the cave a very long time ago (Figs 15-17). In the 1970s, Dr. Andree Rosenfeld (Australian National University, Canberra) had excavated similar engravings near Laura to the north of Chillagoe. These engravings were buried by sediments containing charcoal (and other evidence of human occupation) which dated to 13,000 years ago, indicating a minimum age for the engravings. Therefore, by the time David visited Fern Cave, we already knew that engravings of a similar type (in other parts of north Queensland) were very old. It was possible, therefore, that those found at Fern Cave were similarly old. This possibility was enhanced by the presence of a thick crust (known as cortex) that had formed over the engravings.

The results of the 1985 excavation were not very promising, as the bulk of the archaeological material was heavily encrusted in large blocks of calcium carbonate (Fig. 18). Calcium carbonate concretions form when minerals from the cave wall are dissolved by water running across the rock face after rainfall. The calcium carbonate from the limestone is carried by percolating water, being re-deposited in characteristic formations such as stalagmites, stalactites, columns and the like. Some of the calcium carbonate, however, gets carried down by water into the ground, accumulating around nuclei such as pieces of bone or stone artefacts (Fig. 19). Once this happens, it makes it extremely difficult to analyse archaeological materials, as the calcium carbonate has to be re-dissolved to reveal the archaeological materials inside.

Calcium carbonate concretions can be dissolved in acid baths, but this is a very time-consuming and laborious enterprise, and it is fraught with difficulties. Foremost among these is the fact that stone artefacts made from the local limestone, as well as bone, will also dissolve in acid.

To complicate matters even further, no appropriate charcoal had been retrieved from the 1985 excavations, rendering it difficult to determine the antiquity of occupation at the site. Charcoal is usually the best material on which to undertake radiocarbon dating, as it is a highly concentrated source of carbon, rarely subject to the problems of re-crystallisation that bone and shell can face. Because of these problems, the archaeological materials excavated in 1985 remained unanalysed.

Radiocarbon dating is based on the observation that the proportions of two carbon isotopes, ^{12}C and ^{14}C , remain relatively constant in the atmosphere. All living matter is carbon-based, and in absorbing carbon from the air, animals and plants inherit the same ^{12}C : ^{14}C proportions that occur around them. Once an organism dies, however, the intake of atmospheric carbon stops. At that stage, the ^{14}C atoms, which are radioactive, start changing to nitrogen atoms (^{14}N). The rate at which this takes place is known to be such that half of the ^{14}C atoms in an organism change to ^{14}N every 5568 years. This is known as the half-life of ^{14}C . By measuring the proportions of ^{12}C to ^{14}C in dead organic matter (e.g. charcoal), we can thus work out when that organism died with considerable degrees of accuracy.

In 1989, an opportunity arose for David to undertake preliminary radiocarbon dating of some of the land snails excavated from Fern Cave. Specimens relatively free of calcium carbonate encrustation were thus chosen and submitted for dating. A very old date was obtained, and even though such a date was expected for the beginnings of occupation at Fern Cave (given

the similarity of the engravings there to those dated to pre - 13,000 years at Laura), we were nevertheless sceptical about the results. The reason is that land snails need to continuously consume calcium carbonate in order to ensure shell formation. Since the limestone is largely made-up of calcium carbonate, land snails tend to occur in large numbers in the Chillagoe area. However, the limestone itself was laid down by marine organisms over 400 million years ago; in other words, the limestone was the by-product of organic activity. Therefore, land snails at Chillagoe were potentially eating ancient carbon, making it difficult to determine whether or not the resultant radiocarbon dates could be relied upon. It is possible that the ancient carbon from the limestone was released into the atmosphere before consumption by the land snails (and therefore the date would probably be correct), but it is equally likely that some traces of old charcoal remained. Because of this, experts in radiocarbon dating treat land snails with extreme caution, and usually suggest that land snail dates should only be taken as broad indications of the age of the items dated. It is often suggested that an error margin of up to 2,000 years can be expected from land snail dates.

In spite of this, the radiocarbon date obtained from the Fern Cave sample was intriguing enough to warrant further exploration. The date obtained was 26,010 ±410 years BP, indicating that occupation at the site was indeed likely to be very old. This was, at the time, the oldest radiocarbon date from an archaeological site in Queensland (the above problems notwithstanding).

A second excavation at Fern Cave was thus planned in order to determine the reliability of this date. The original excavation had been located fairly close to a source of percolating water. If the new excavation was placed at some distance from this spot, our chances of obtaining archaeological materials not embedded in large blocks of calcium carbonate would be

considerably enhanced. Furthermore, there was a chance that pieces of charcoal could be retrieved, thus solving the problem of obtaining a reliable radiocarbon date.

In 1989, the site was thus re-excavated (Fig. 20). As expected, the sediments did not contain large blocks of calcium carbonate. Rather, the cultural deposits, including stone artefacts, animal bones and other items, could easily be identified, even though some of them were coated with thin layers of calcium carbonate. Small pieces of charcoal were also found, as were large quantities of land snail shell.

The charcoal is currently being analysed to determine whether or not it is appropriate for dating. For example, was the charcoal created when tree roots were burnt under the ground as a result of nearby bushfires? If so, then the charcoal should not be used to date the deposit in which it occurs, as it will be younger than the sediments around it (dating the tree that used to grow above).

While waiting for the charcoal results, a number of land snail shells were thus submitted for further radiocarbon dating. The results obtained have so far been highly consistent, with all the carbon dates being in proper sequence (there are no reversals), indicating that the dates are likely to be correct. The sequence of radiocarbon dates has offered support for human occupation at Fern Cave some 26,000 years ago.

In order to further investigate the antiquity of the Fern Cave sediments, a number of other tests were undertaken. Firstly, samples of sediment were extracted from the walls of the excavation after the excavation was finished. The sediments were taken out in blocks and sent to Dr. John Magee, Department of Geomorphology and Biogeography at the Australian National University. The sediments were impregnated with resin and, once dry, the sediment blocks were

thin-sectioned for microscopic examination. By analysing the nature and structure of sediment particles in this way, information could be gathered on the origins of the sediments and their subsequent sources of disturbance. The results of this test indicated that the beginnings of human occupation at Fern Cave corresponded well with a major stratigraphic change, and that there was no evidence that the sediments had been re-worked. In other words, the site had fairly good stratigraphic integrity, and it was thus legitimate to assume that material became older the further down one went (as one would expect in relatively undisturbed deposits).

In addition to the above, Magee also examined the mineralogy of the land snails excavated from Fern Cave. This was an important step for a better appreciation of the land snail dates. The results of this analysis revealed little evidence of re-crystallisation, leading Magee (1993) to conclude that "the integrity of the land snail dates is not questioned". A final test was subsequently undertaken to determine whether or not the sediments at Fern Cave had been mixed up. Nitrogen usually occurs in greatest abundance near the surface of the ground (largely as a result of plant activity). Through time, nitrogen levels decrease by the effects of water, leaching and the like. By analysing the nitrogen content of different levels of the excavation at Fern Cave, we should thus expect undisturbed sediments to have decreasing levels of nitrogen down the sediment profile. This is precisely the pattern that we obtained at Fern Cave, offering further evidence for the integrity of the sediments at the site.

Being thus secure with the knowledge that the Fern Cave sediments possessed relatively good stratigraphic integrity, and that the oldest levels probably dated to around 26,000 years ago, a detailed analysis of the cultural materials from Fern Cave could proceed.

Fern Cave: the Cultural Sequence

Fern Cave contains large numbers of stone artefacts and other cultural materials deposited during various episodes of human activity. We know that Aboriginal people started living in the cave shortly before 26,000 years ago, before the onset of the last glacial maximum. The intensity of occupation at that time was probably low, as few cultural materials were found from that period of time. Around 22,000 years ago, however, amounts of cultural materials began to increase dramatically. This was especially so of the numbers of stone artefacts and animal bones, with high densities continuing until about 17,000 years ago. Quantities of cultural materials then decreased again, never again to attain the peaks of the last glacial maximum. The only exception to this were the earth pigments used for painting, stencilling and/or printing, which peaked sometime during the Holocene (it is not possible to say exactly when as the entire Holocene period is contained within about six centimetres of sediment only) (Figs 21-22). The implications are that Fern Cave witnessed its greatest intensities of occupation during the height of the last ice age, some 22,000 to 17,000 years ago, followed by a long period of low-level occupation or visitation. This prompts us to believe that, during the Holocene, the cave was used mainly for painting and related activities, rather than as a base camp.

The reasons for such a concentrated use of the site during the height of the last ice age are more than likely because permanent springs occurred near Fern Cave (Fig. 23). They would have been particularly attractive from 22,000 to 17,000 years ago, when the region was at its most arid. Water was sparse at that time, leading people to rely on a small number of water sources. Aboriginal people at that time were probably more restricted in their choices of movement, and this is an issue that can be further investigated by looking at the resources that

were brought into the site and deposited there.

Such an analysis is precisely what we have attempted with respect to the stone artefacts, as well as the ochre. So far, we have found that most, if not all of the earth pigments used to make paintings and stencils, came from the local limestone zone. The stone artefacts, however, have revealed a more detailed picture that may be critical to a proper understanding of the history of human occupation at the site. The peak of the last ice age (approximately 22,000 - 17,000 years ago) was a period of considerable climatic change. An analysis of the stone artefacts from this period was undertaken in order see what they might tell us about human behaviour, and use of Fern Cave, during this time of the region's occupational history.

Several important observations were made regarding the manufacture of stone artefacts at Fern Cave, prior to and during the peak of the last ice age:

- (1) knappers were selecting to use a source of raw material that occurred close to the cave, in favour to a source that lay some distance from the cave during the peak of the last ice age.
- (2) people flaking the stone (knappers) were obtaining fewer flakes from each core during the peak of the last ice age.
- (3) the rate of artefacts with 'snap-fracture' edge damage increased during the peak of the last ice age.

The shift from using distant raw materials to using those occurring close to the cave, indicates that the size of the territory in which people moved to collect stone was reduced. The accompanying decrease in the number of flakes obtained per core implies that the stone being used was not scarce, nor was it in need of being conserved. This is the pattern one would expect from the utilisation of a close and easily accessible stone source.

The environmental data suggest that the Chillagoe region was relatively dry during the peak of the last ice age, with the exception of several permanent springs located within two kilometres of Fern Cave. It is likely that there was less seasonal availability of water in the region, and that this limited the areas suitable for habitation during the peak of the last ice age. As stated above, this could well have prompted people to concentrate on Fern Cave, considering that there were several permanent sources of water in the close vicinity - thus explaining the increase of local stone in the archaeological record.

The increased proportion of stone artefacts with 'snap-fracture' edge damage, during the peak of the last ice age, also supports the notion that Fern Cave was used to a greater extent during this time; this form of edge damage is often associated with human trampling within sites. Therefore, one could argue that increased snap-fracturing = increased trampling = more intensive use of the site, again due to the permanent water sources in the near vicinity.

All in all, a large number of tests have now been undertaken at Fern Cave. The archaeological story that is emerging is consistent on all fronts, indicating that during the height of the last ice age, when environmental conditions were driest, Aboriginal people were more dependent on a smaller number of water sources - at least during the dry season. Because of this, Fern Cave became a prime area for occupation, as a number of permanent springs offered water in an otherwise dry environment. It would be interesting to see if this pattern is also evident in other sites, but this issue may take a while to explore in sufficient detail, as not many old sites have been located. Nevertheless, it is interesting to note that Walkunder Arch Cave began to be occupied around 16,000 years ago, not long after environmental conditions at Chillagoe began to be wetter. Given that there are no permanent water sources near the site, it

is not surprising to find that human occupation did not take place at Walkunder Arch Cave during the peak of the last ice age.

Pillar Cave

Archaeological excavations at Pillar Cave began in the mid-1980s (Fig. 24). They are currently being undertaken by Mireille Mardaga-Campbell (James Cook University, Townsville) as part of a broader project aimed at studying the way that Aboriginal people used to structure their living space inside caves and rockshelters. For instance, some parts of a cave may be used for sleeping, and other parts for eating or other activities. If an archaeologist is trying to study, for example, the diet of a past population, it may be important for them to know which parts of a cave to excavate if they are to obtain the maximum amount of information to answer their research questions. Furthermore, a more 'total' understanding of site use may be important for a proper characterisation of prehistoric life at Chillagoe.

Mardaga-Campbell's work is thus potentially important, not just for archaeologists working in Chillagoe, but for archaeological inquiry in general. Unfortunately, her work is not yet completed, and therefore little information is yet available. So far, she has focused on the late Holocene levels of both Pillar Cave and, along with John Campbell, Walkunder Arch Cave, to try to identify distinct living floors - so that contemporaneous structures may be identified and related to each other. At Pillar Cave, Mardaga-Campbell has so far identified a series of ashy layers dating back to almost 2,000 years ago, although she has not yet reached the earliest occupation levels. It is suspected that people first began to live in the site during the Pleistocene period - that is, more than 10,000 years ago - but this prediction will have to await further work

at the site.

Echidna's Rest

Echidna's Rest is a large rockshelter located to the northwest of Chillagoe. It contains a large, sky-lit opening in an above-ground limestone karst formation, with near-vertical walls up to 30m in height. The sky-lit chamber can be reached by a single, small opening in the rock wall at ground level.

We called the site Echidna's Rest because, when we first walked into it, we found a naturally mummified echidna. It must have died in the cave during the dry season, and subsequent dehydration caused its body to dry-up and 'mummify'. Not far away, we also found a rat in a similar condition.

Evidence of human occupation at Echidna's Rest occurs in the form of paintings, charcoal, stone artefacts, burnt bone and other cultural remains on the ground (Figs 25-26). As with Pillar Cave, we have not yet reached the base of the cultural deposits at the site. Therefore, we do not yet know when people first began to live there. We do know, however, that this took place sometime before 3,000 years ago. Since that time, Echidna's Rest has witnessed major changes in patterns of site use. In particular, the intensity of human occupation increased dramatically around 3,000 years ago. This was followed by a second increase around 700 years ago. The latter involved the first appearance of stone adzes in the site, as well as a more intensive use of other wood-working tools. Furthermore, during this time the numbers of stone artefacts dropped in the site increased five-fold, and a larger proportion of these artefacts showed evidence of having been used. Together, these points indicate that between 3,000 and 700 years ago the

manufacture of stone implements and the working of wooden items was not particularly intensive at Echidna's Rest, but that this increased significantly after 700 years ago.

The most important change, however, took place after 3,000 years ago. This is when the frequencies of all types of cultural materials increased the most. It could be argued that the last 3,000 years witnessed major increases in intensities of site use at Echidna's Rest.

THE ROCK ART

Many visitors to rock art sites at Chillagoe expect to see paintings like those of Kakadu or Laura - that is, multi-coloured images of animals and humans, sometimes painted in X-ray or with complex internal decorations (Figs 27-29). The art of Chillagoe, however, is not like this. It is much more akin to that of central and southern Australia, as far as motif shapes are concerned. The paintings consist of linear shapes, such as single or multiple lines, circles and their variants, star-shapes, grids and so forth. This is also true of the engravings. In other words, much of the art is abstract, or what we would call non-figurative, in form (Figs 30-43).

The reasons for the difference between the art of Chillagoe and that of other areas to the north and northwest is based on the fact that the rock 'art' is more than just art (Figs 44-52). The images we see on the rock walls were usually depicted within the context of the Dreaming. At times, they indicated particular Dreaming beings or events, or designs that were associated with these. Rock art was also one means by which elders taught young people about the Dreaming, the Law of the land. As the Dreaming and the Law are not distinct from the land, these teachings could at times outline the nature of the land itself - a sort of 'map' of the cultural and natural landscape. In other words, although aesthetics may have something to do with it, the

art was not simply meant to be a decorative thing within a cave, for it played an important role in expressing people's Dreaming beliefs. Within this context, we find that everywhere in Australia paintings and engravings were undertaken as part of Aboriginal ways of expressing and living their beliefs. There are many ways in which this could be done, leading to different rock art styles across the landscape - the conventions that people followed were different in different places.

Rock art is notoriously difficult to date (Fig. 53). Few paintings contain enough organic matter to be able to date them directly, so that most inquiries offer circumstantial evidence at best. Nevertheless, we have so far been able to determine that most of the rock paintings at Chillagoe are probably no more than about 3,000 years. The engravings are probably older, and it is interesting to note that, in both cases, a very broad range of motif forms occur.

In comparing the art of Chillagoe with that of neighbouring regions, we have found that the engravings, which are believed to be usually (but not always) older than about 3,000 years old, are similar in shape right across north Queensland, from Laura in the north to Chillagoe in the south. After 3,000 years ago, however, this changed, with each region beginning to develop its own individual painting styles. This included the emergence of a major stylistic difference between the figurative art of the northern areas (e.g. Laura, the Mitchell-Palmer limestone belt) and southern ones (e.g. Chillagoe, Ootana). Interestingly, these two broad geographical blocs are divided by the rugged, mountainous Featherbed Ranges, which may have acted as a more or less effective natural barrier to social interaction between the two regions (Fig. 54). Because of this, we have argued that the late Holocene period witnessed a regionalisation of artistic activity in northern Queensland.

The implications of such changes may have great importance in Australian prehistory. In particular, we need to ask what types of things may give rise to a regionalisation of human behaviour. One possible interpretation is that populations increased, leading to increases in conflict and a subsequent break-up of social groups. As a result of this, individual groups began to develop their own social conventions, including rock art styles. The excavations at Walkunder Arch Cave and Echidna's Rest, as well as at over 20 other excavated sites from other parts of north Queensland (especially from Laura), all indicate a major increase in cultural materials during the late Holocene. Therefore, the idea of increasing populations at that time makes sense.

This is the interpretation that we have put forward. If it is correct, we still need to ask what caused the population increase in the first place. Remembering that Aboriginal people had been here for at least 40,000 years, we cannot simply say that population levels remained stable until 3,000 years ago, and all of a sudden they began to increase. Neither can we say that population sizes were *gradually* increasing during all of this time, for there is no evidence of this. Rather, we could inquire into social forces that lead to changes in human populations.

Population sizes are regulated by social forces, such as infanticide, wars and such things. More subtle forces include the amount and quality of available foods and general lifestyles, as such things will affect a person's fertility levels, reproductive abilities and a society's demographic patterns. We would argue that the changes taking place around 3,000 years ago involved changes in human lifestyles, which in turn led to changes in population sizes, which then resulted in further social changes - such as a regionalisation of social networks.

The Rock Art Sites at Balancing Rock and Mungana

Two rock art sites are open for public visitation near Chillagoe. They are both excellent examples of the art of the Chillagoe region. In particular, the site near Balancing Rock can be said to be typical of the region. We do not know what any of the art meant to the artists. Meanings may change through time and with context of visitation. The point to note at these sites, however, is the largely non-figurative (abstract) nature of the paintings. When visiting other rock art sites in north Queensland, especially around Laura, the differences will be immediately obvious.

Unfortunately, no rock art sites possessing old peckings (petroglyphs) are open to the public. Petroglyphs are relatively rare around Chillagoe, and their shapes tend to be similar to those of other surrounding regions.

The site near Balancing Rock contains a large number of linear, abraded grooves. We are not sure whether these are part of the rock art assemblage, or whether they were made when stone or wooden tools were sharpened against the cave wall. In either case, it is interesting to find that such grooves are virtually restricted to the limestone outcrops in north Queensland. It is likely that the softness of the rock has a lot to do with where abraded grooves will be found.

CONCLUSION

The archaeology of the Chillagoe region is a valuable cultural-heritage resource, for Aboriginal and non-Aboriginal Australians alike. Archaeological work being conducted in the region has made (and is making) an important contribution to the piecing together of prehistoric Aboriginal lifeways in this country. We hope that this book will provide its readers with a

greater understanding of the significance of the Chillagoe region and its archaeological sites. It is vital that people appreciate this significance, in order to serve towards the maintenance and continuing existence of such a culturally rich region.

There is something that everyone should keep in mind when visiting some of the Chillagoe sites - that there are people alive today who are the direct descendants of the very people whose cultural remains archaeologists are studying. For that reason, the Chillagoe archaeological sites should be treated with the respect that we would accord to the home of an ancestor in our own society. If these sites are not treated with the respect they deserve, it is very likely that the option to study and visit them may be taken away from us.

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