

Dreamtime cave

Spectacular art works adorning a remote rock shelter in northern Australia have stunned the archaeological world and are reconnecting an ancient people with their ancestry.

Elizabeth Finkel is given rare access to a recent discovery that's rewriting human prehistory.



Arnhem Land

As stunning as the Sistine Chapel: the ceiling of the recently rediscovered Gubarnung rock shelter is adorned with elaborate paintings, some of which extend down sandstone columns. Arnhem Land's 91,000 km² of Aboriginal-owned land is rich with ancient art sites and this could prove to be the most significant.

A **SMALL ABORIGINAL** woman peers through the microscope at the sliver of rock. Perched precariously on a stool, her feet barely touch the ground. "Do you want us to go on, Auntie?" asks archaeologist Bruno David. "Yes," she says emphatically in a low quiet voice. "I want my grandchildren to know about our culture." >>





>> It's an unusual gathering for the archaeology lab at Melbourne's Monash University. 'Auntie' is Margaret Katherine, an elder of the Jawoyn people; David is the lab's co-director. Then there is carbon-dating expert Fiona Petchey from New Zealand's University of Waikato, archaeologist Mark Eccleston – with his shiny steel X-ray fluorescence gun – from Aboriginal Affairs Victoria, plus documentary film-makers Bentley Dean and Martin Butler, and me.

We are all focussed on Margaret Katherine, whose attention is on a triangular piece of quartzite measuring close to 4cm across its greatest length. Under the microscope its treasure becomes clear: a very finely painted black cross whose lines seem to continue beyond the edges, as if it were part of a larger image. The black pigment is charcoal, meaning it might be possible to scrape off a tiny bit to carbon-date the miniature painting. This is an extraordinary artefact, recovered by David's colleague Bryce Barker from the University of Southern Queensland during a recent dig of the floor of Gabarnmung cave.

Gabarnmung has been rewriting world pre-history since its 2006 'rediscovery' by the Jawoyn. The cave is perched on a sandstone escarpment high in southwestern Arnhem Land, east of Darwin. Arnhem Land is wholly owned by Aboriginal tribes and much of the escarpment lies within the 50,000 km² ancestral lands of the 600-member-strong Jawoyn. The escarpment's unusually hard quartzite rock is the canvas for one of the world's most spectacular collections of rock art – an archaeologist's utopia, its diverse styles preserve a sequential record of a people who have occupied this landscape for more than 50,000 years.

Much remains to be learned about this art. Archaeologists are uncertain about the age of the paintings and their precise meanings. It's safe to say some tell stories of the Dreamtime – the Aboriginal telling of the creation of the world – and also serve to mark clan territories, since different clans recognise different spirit-beings.

"We know this from what Aboriginal elders have told anthropologists over the last 100 years," says David.

Others may simply be works of art – expressions of the quintessential human urge to leave one's mark. Tens of thousands of years ago, Margaret Katherine's ancestors, nicely sheltered from the rain and wind, would have been cooking a meal on the floor of Gabarnmung and, no doubt, occasionally gazing up at the art work on the ceiling. Some of the art was old, even then, and a



Rock of ages

The charcoal cross on this tiny sliver of quartzite – shown here to scale – represents the artistic endeavours of a person who lived millennia ago.

BRUNO DAVID

fragment broke off, landing on the ground to become buried by the cave's fine dust, rich in charcoal soot. But ever so slowly, at a rate of centimetres per millennia. Elsewhere, in the lowlands, artefacts are buried at a rate of metres per millennia. In mid-2011, six months prior to the Monash University gathering, Barker fished that fragment out of an excavation trench just 50 centimetres below the floor of the cave. When he had wiped off the dust to reveal the black cross, he realised he was holding archaeological gold. Now it's hoped that a tiny bit of the pigment can be extracted from the painted cross in an attempt to get a carbon date. The process will partly destroy the tiny painting but, for Margaret Katherine, it will be worth it.

A LOT IS RIDING on this little rock art fragment. It's clearly very important for Margaret Katherine and the rest of her people. Science is helping the Jawoyn flesh out their deep history. In the few months of seasonal digging at the cave, which commenced in May 2010, the international team headed by David has made extraordinary finds. "We are rewriting human prehistory," Ian McNiven,

An archaeologist's utopia, its diverse styles preserve a sequential record of the people who occupied this landscape for over 50,000 years.

a Monash University archaeologist and team member, told me.

David has assembled an illustrious team. As well as the Australians and New Zealander, there is a French contingent headed by Jean-Michel Geneste, from the Université de Bordeaux 1. Geneste is curator of France's national treasure, the prehistoric Lascaux Cave. He also directs

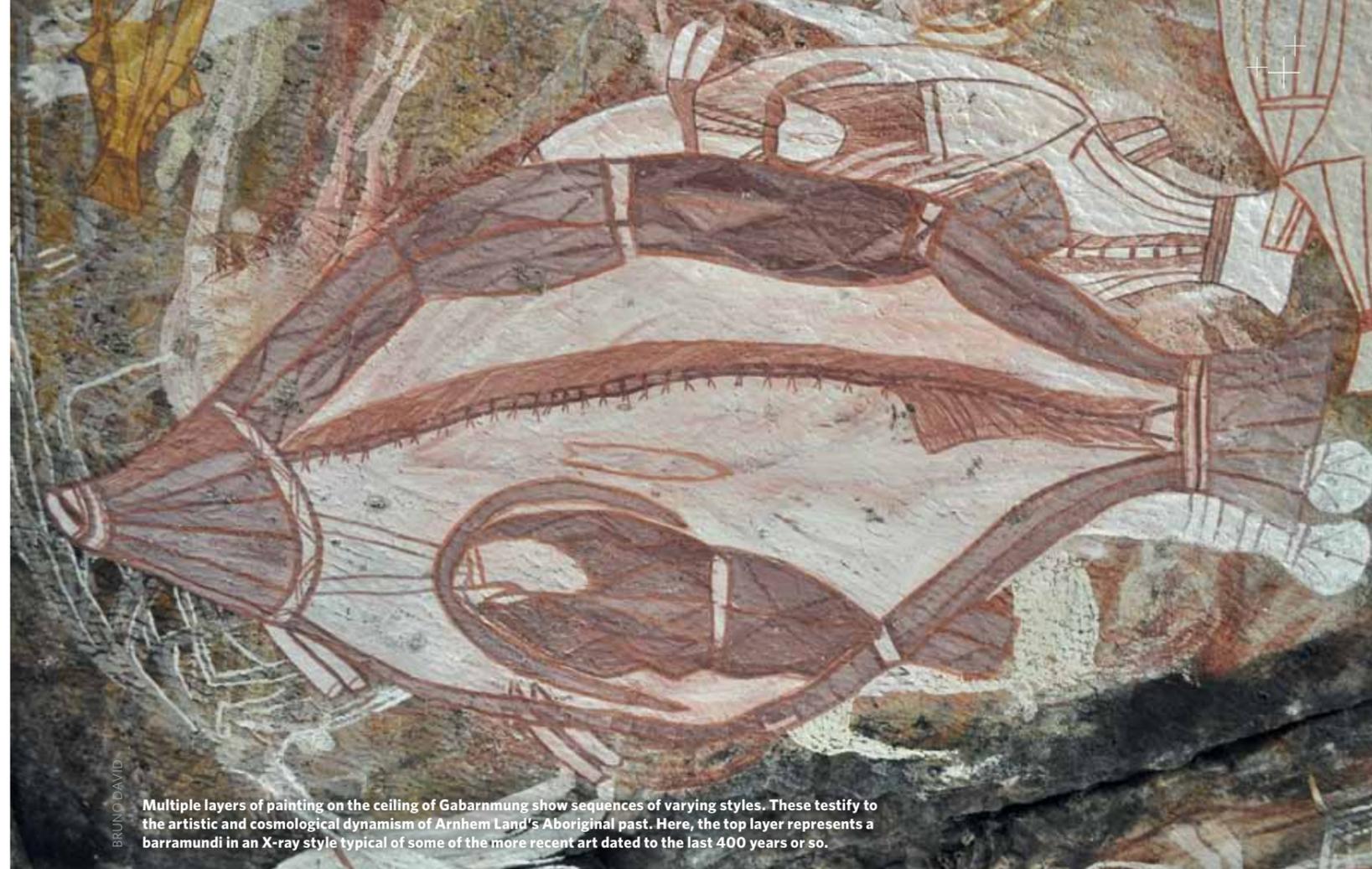
the international research program at Chauvet Cave, where dynamic charcoal paintings of ponies, rhinos, bison and lions evoke the technical mastery of a Japanese brushstroke artist. Human eyes had not viewed this labyrinthine gallery for tens of thousands of years until 1992 when a trio of cavers felt an updraft in the cliffs of the Ardèche river canyon in southern France, and lowered themselves in. A steel door now protects the cave from the public and each year only a handful of researchers may enter, under Geneste's direction. Among Chauvet's treasures is the world's oldest known painting, depicting two battling rhinoceroses. Tiny scrapes of charcoal pigment gave it a carbon date of 36,000 years old.

But people lived at Gabarnmung for thousands of years before Chauvet was occupied: charcoal deposited above the very bottom layers of the Arnhem Land cave has been carbon-dated at 48,000 years old. For Europeans this is the stuff of pre-history; they have no direct connection to this era. Not so for the Jawoyn. The paintings, tools, spears, ochre-anointed skulls and bones, are their *history*.

The 2010 dig at Gabarnmung also unearthed a piece of a basaltic stone axe 4cm long and 2.5cm wide, lying about 50cm below the cave floor. It was not so startling to find a stone axe. Ancient people have been smashing two rocks together to produce stone tools for more than two million years. What was different about this axe was that someone had sat down with a stone and skilfully ground it until a sharp edge was made. Under the microscope the parallel striations wrought by the patient toolmaker are evident. Stone toolmaking was, like writing, one of those technological milestones that evolved independently in different civilisations. But

the Gabarnmung axe supports evidence that it was people in Eastern Asia, New Guinea and Australia who got there first. Throughout Australasia ground axes are found at ages greater than 20,000 years; in Europe, Africa and West Asia, the oldest ground axes are 8,000-9,000 years old.

Perhaps the Gabarnmung axe was used to chop pieces of goanna for the cooking fire. When its owner left the cave for the season, the axe must have slipped into the charcoals – the same charcoal now carbon-dated to 35,500 years old. This is a very, >>



BRUNO DAVID

Multiple layers of painting on the ceiling of Gabarnmung show sequences of varying styles. These testify to the artistic and cosmological dynamism of Arnhem Land's Aboriginal past. Here, the top layer represents a barramundi in an X-ray style typical of some of the more recent art dated to the last 400 years or so.



BRUNO DAVID

Seated in the shadows of her ancestors and hoping to define a history for generations to come, Margaret Katherine, an elder with the Jawoyn of western Arnhem Land, meets with archaeologist Bruno David (right) in Gabarnmung Cave.

Bryce Barker, head of anthropology at the University of Southern Queensland, works at the square where the sliver of quartzite was found.

BERNARD SANDERRE

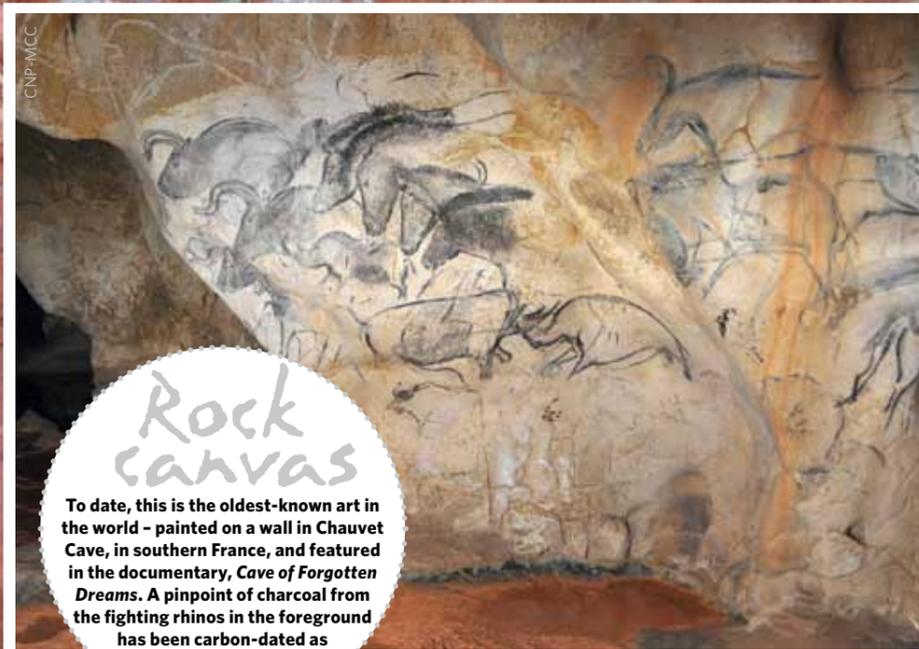


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A metre-high painting of six top-hatted gentlemen on the deck of a clipper – a record of a recent-history encounter with Europeans – forms part of a rock shelter gallery of sailing boats, people and native animals. This was the image that guided helicopter pilot Chris Morgan and Jawoyn Association cultural and environmental officer Ray Whear (below) when they ‘rediscovered’ Gabarnmung in 2006.



ALAN FINKEL



CNP-MCC

Rock canvas
 To date, this is the oldest-known art in the world – painted on a wall in Chauvet Cave, in southern France, and featured in the documentary, *Cave of Forgotten Dreams*. A pinpoint of charcoal from the fighting rhinos in the foreground has been carbon-dated as 36,000 years old.

>> very old ground axe – older than ancient ground axes previously found in New Guinea, China or Japan. It is, in fact – for now – the world’s oldest ground axe. The Jawoyn ancestors were the innovators of their time.

In 2011, returning to the Gabarnmung dig in July – after that time it becomes impossibly hot or impossibly wet – the archaeologists excavated a trench on the opposite side of the cave and unearthed the painted rock fragment we’re now looking at in the Monash Uni lab. The charcoal layers which bookended it have been dated at 20,000-30,000 years old. Geneste, who knows a thing or two about ancient rock art – having spent 15 years dating the charcoal pigments at Chauvet Cave – thinks it might be something very special. The Chauvet rhinoceroses are, so far, the world’s oldest record of modern human beings “socialising their environment”, Geneste explains. But he suspects some of the Gabarnmung art is likely to be just as old, probably older.

FOR THE JAWOYN, putting scientific flesh on the bones of their ancestral beliefs – their Dreamtime – is compelling. Like elders of every culture, they are consumed by the responsibility to pass their knowledge to the next generation. The Jawoyn Association – established in 1985 to develop unity and economic independence for the Jawoyn – is one of Australia’s most successful indigenous business operations. Even so, this next generation is at risk. The remaining holders of traditional knowledge – fractured and fading as it is – are few and dying. And the Jawoyn youth still run the gauntlet of ills that beset all marginalised Aboriginal communities – drugs, alcohol, violence and the easy slide into welfare dependence. Community leaders believe science will help form a bridge for the next generation, helping connect the ancestral Dreamtime to modern times and, in the process, nurture self-esteem and ambition. “We want our kids to grow up to be archaeologists, geologists, helicopter pilots,” says the Jawoyn Association’s CEO, Preston Lee.

And if science can offer something to the Jawoyn, the Jawoyn have something to offer science. Geneste explains by phone from his 300-year-old stone cottage in the



Ancient tool
 A 2010 dig at Gabarnmung unearthed this piece of basaltic stone axe. Carbon-dated charcoal where it was found dates it at 35,500 years old, suggesting people have been using this cave for at least this long.

BRUNO DAVID

south of France: “We don’t have anyone to explain Chauvet Cave to us. In France, these are sites with no memory, no life. With Gabarnmung, we are lucky. There is the living culture, the memories. The Jawoyn can help us build a new knowledge.” Geneste offers an example: “We found a kangaroo mandible covered in ochre and showed it to Margaret. The next morning she said, ‘I remember now. It was a tradition when a young hunter killed his first game. He wrapped it in paper bark, put it in a cave and preserved it under the authority of an Auntie.’ Together we are finding out things about their history.”

HELICOPTER PILOTS ARE well-regarded by the Jawoyn community. Indeed, if it were not for helicopter pilots, Gabarnmung would be just another cave of forgotten dreams. In 2006, pilot Chris Morgan was flying his chopper across the sandstone escarpment. Next to him sat sandy-haired, easy-going Ray Whear dressed in grungy shorts and a T-shirt, one of the Northern Territory’s most successful businessmen, who now manages the cultural and environmental affairs of the Jawoyn Association.

The chopper roared as Whear trained his eyes on a landscape seemingly untouched by European contact. He saw the sparkling Katherine River snaking through the broken brown plain below and the great pale-green expanse of savannah woodlands. But what he and Morgan were really interested in were the rocky outcrops that dotted the landscape. They were returning from a bushfire management meeting and had decided to indulge one of their favourite pastimes – rock-art spotting. The clue, says Whear, is the shine on the rocks.

The paintings extended up and down 36 remarkable sandstone columns that, like the pillars of a temple, appeared to support the cave.

It might mean lots of human bottoms have graced them, perhaps for a ceremony involving art. Whear and Morgan have had some spectacular finds – like an ochre painting of *Genyornis*, a giant flightless bird

that’s been extinct for 45,000 years. Could the painting itself be that old? So far, there has been no way to date it.

This time, Whear and Morgan once again spotted some rock shine. They zeroed in to find their chopper face-to-face with six top-hatted gentlemen gazing at them from the deck of a clipper ship. The metre-high white ochre painting formed part of a gallery of sailing boats, barramundi, emu, yam figures, dynamic figures, X-ray kangaroos and crocodiles, rainbow serpents and the now extinct Tasmanian tiger! But the real prize awaited them. Back in the chopper they trained their eyes on the surrounding area and some five kilometres away noticed an unusually large rock shelter. They landed and walked into one of the richest collections of Aboriginal art ever found. Like the Sistine Chapel, the ceiling of the expansive rock shelter was a mural of breathtakingly vivid and bold works of art – hundreds of them. And the paintings extended up and down 36 remarkable sandstone columns that, like the pillars of a temple, appeared to support the cave.

When they returned with two elders, Wamud Namok and Jimmy Kalariyya, it was an emotional moment. The elders remembered visiting the site as children, that its name was Nawarla Gabarnmung – meaning ‘hole in the rock’ – and that its traditional owners were a Jawoyn clan called the Buyhmi. Margaret Katherine is a Buyhmi elder and it was her decision in 2010 to invite a team of international archaeologists and rock art experts to explore the cave. The first invitation went to Bruno David. His reputation had preceded him, particularly his sensitive work with communities in Cape York and the Torres Strait islands.

I MET DAVID IN October 2011 during a tour of the Gabarnmung cave when I was privileged to join a select handful of visitors who have so far had that honour. David has an adventurous, athletic look. He wears hiking gear, is of medium athletic build, has slightly receding long dark curly hair, olive skin and luminous blue-green eyes. I’m guessing 40-something. His accent is hard to pick. It turns out to be highly eroded French but you’d be hard pressed to figure out his nationality. David could be a native of any place.

What strikes you most about him is his gentleness. It’s no surprise that Margaret >>



>> Katherine invited him. She has given him and his two-year-old son 'skin' names – part of her people's social structure – and he calls her 'Auntie', a mark of respect. David's connection with the Jawoyn is clearly more than just academic.

Geneste has also been given a skin name. "More and more it's not just fieldwork," he says. "We have conversations around the fireside, at camp, in the early morning and before we go to sleep. The exchange of worlds is happening."

But it was not always so. Archaeologists and Aboriginal communities have a troubled history. The late 1960s saw remarkable discoveries of skeletons dating back 30,000 years or more that told the story of the ancient colonisation of Australia. There was also evidence of the world's first ceremonial burial with an ochre-daubed 30,000-year-old skeleton unearthed in Lake Mungo, 760km west of Sydney. These were archaeological treasures but also the remains of ancestors. The Aboriginal custodians demanded reburial and with it, buried much of Australian archaeology for the next couple of decades. Australian archaeologists went off to Egypt and other places to ply their trade. Now, very carefully they are making their way back, cautiously awaiting invitations to collaborate with traditional owners.

At the airport, *en route* to Darwin, I discuss Aboriginal art with David and he takes me straight to the heart of the matter. I don't get some detached academic description of technique or style; David channels the Aboriginal sensibility.

"Country is one of the most powerful notions," he says. "We don't talk about time; we talk about place. The connection with ancestors is unbroken." I begin to understand: the painted rocks and caves, indeed the entire landscape, is a timeless stage where the veil between present and past is drawn back.

For all David's empathy, he is also a very hard-nosed scientist. Indeed, to survive in archaeology, he has to be. All science is brutal – "organised scepticism" – some say. But archaeologists are positively gladiatorial when it comes to challenging each other. Whether their findings stand or fall often depends on how meticulously they can measure the age of the material they find. "We don't want anything iffy," David says.

A GOOGLE SEARCH reveals claims for Australian rock art being up to 40,000 years old. But as Geneste tells me, "This

represents the philosophical divide; art is art and science is science." Art experts might be a little fast and free with their dates but even the scientific dates leave some doubt. It's hard to carbon-date very old paintings because pigments in organic material, such as beeswax or charcoal, usually don't last the test of time – unless they are entombed in a dark sealed cave like those at Chauvet. (Carbon-dating can only be used to date substances that were once alive since it measures the ratio of carbon-14 to carbon-12, a ratio that declines once an organism dies). Ochres endure but don't carry organic material, so they can't be carbon-dated. Hence indirect methods have been used which do tend to be iffy. For instance, a piece of ochre-coated rock was found in the charcoals of a fire site in Carpenter's Gap in the Kimberley region of Australia's northwest. Those charcoals gave a date of close to 40,000 years. But was the ochre on the rock really the remains of a painting or a natural mineral deposit? "Unless you have an image, you can't be sure," says David.

Science is helping the Jawoyn flesh out their deep history.

Mud wasps offer another means of dating rock art. Wasps have a penchant for building their nests in the same rock shelters favoured by indigenous artists and often plaster them right on top of the paintings. Sometimes those nests are extremely old, so old they have become fossilised. In 1997 Bert Roberts, now at the University of Wollongong, pioneered a method for dating the individual grains of sand buried in ancient wasp nests known as OSL (optically stimulated luminescence). In the darkness of the nest, electrons in the sand grains, nudged by background radiation, become entrapped in the sand grain's quartz crystal lattice. The longer they are buried, the more electrons are trapped. Roberts plucks these buried sand grains from the wasp nest at night with the help of a red-light torch. Back at his lab, he places the individual grains in a photon counter and zaps them with light, freeing the trapped electrons. The number of photons released equates to the number of years elapsed since the wasp first entombed the sand grain in her nest. So the painting underneath the nest must be even older. In 1997, in a paper published in *Nature*, Roberts used the technique to date a mulberry-ochre-

coloured human stick-figure at King Edward River Crossing in the Kimberley region of northwest Australia. He reported a date of at least 17,000 years. Most archaeologists accept it as the oldest date for Australian rock art, though there are still reservations – even from Roberts himself.

THAT'S WHY THE painted fragment from the floor of the Gabarnmung cave is causing so much excitement. There is a clear image. "No-one doubts that it's a piece of a painting," says David. It is very finely drawn. It could even be part of a 'dynamic figure' – the local stick-figure style that resembles Kimberley art styles like the Bradshaw Paintings. Says Roberts, "When it comes to getting dates, the below ground evidence [referring to the buried art fragment] may be better than what's above."

The dark pigment itself is charcoal – and because it has lain in the ground for thousands of years, it is possibly as well-preserved as the charcoal pigment that inscribes the rhinoceros at Chauvet Cave. A mere pinpoint of charcoal was required to get the date on that rhino. Perhaps a mere pinpoint of charcoal will also suffice from the Gabarnmung fragment?

Unfortunately, it's rarely so easy. There are many pitfalls waiting to ensnare the archaeologist who dares to date rock art. And David is determined not to be ensnared. His meticulousness is on full display here in the Monash lab. Here I witness meticulousness *on steroids*.

One possible pitfall is that when carbon-dating expert Fiona Petchey scrapes the charcoal pigment from the rock she will also take off microbes that have grown there. Microbes make organic compounds, such as calcium oxalate, that will corrupt the true carbon date of the charcoal pigment. That's why colleague Mark Eccleston has brought along his X-ray fluorescence gun. It can detect the calcium from calcium oxalates.

Eccleston trains the shiny steel gun just above the rock fragment. For a minute or so, two red lights flicker around its barrel as if contemplating the object below. They stop and the gun delivers a verdict. There is a minuscule amount of calcium: 108 parts per million. "At first look, it seems there is nothing to worry about," David explains. Margaret Katherine says, "I'm so excited. I respect my country. That's why I want you to find out how many generations ago people did this painting."

The excitement builds. Petchey in her white

lab coat now sits on the lab stool peering down at the rock fragment under the microscope. She holds a scalpel and starts to peck at the black cross decorating the rock surface. We all watch silently. More pecking and some halting, doubtful comments from Petchey... It seems we have an anticlimax.

Petchey ceases her pecking. She says, unfortunately, that she simply cannot scrape off the pigment as it is too solidly bound to the rock. She asks if she may take the fragment to Waikato University so that the specialist chemist there can extract the pigment in the lab. They may be able to combust the dark pigment and test that it is indeed charcoal. If that fails, they might also try to get a date on the charcoal residue that dusts the upper surface of the rock. Margaret Katherine gives her permission.

Elizabeth Finkel is an award-winning writer and best-selling author. A *Cosmos* Contributing Editor, she is one of a handful to have visited the cave since its rediscovery.

Epilogue

Not long before going to press, I called David for an update on the rock fragment. He had just received the raw data. They could not extract enough of the pigment that had painted the cross for analysis. But they had been able to date the charcoal dusting the back of the painting. It was 28,000 years old. The tiny painting had not won the big prize, the one that would put it on the cover of *Nature* or *Science*. Chauvet's rhinoceros still rules. But 28,000 years, David points out, is still the oldest scientifically established date for an Australian painting, although the finding has yet to enter the gladiatorial arena of peer review and publication.

But it's not the end of the story. Digging at Gabarnmung has just begun. Says Geneste, "I think there could be art work as old or older than Chauvet." For the next dig David will also be bringing in Bert Roberts who, in the 1990s, together with the late Rhys Jones, identified Australia's oldest sites of human habitation just tens of kilometres away: Nauwalabila and Malakunanja 2 rock shelters. Those ages came in at 50,000 to 55,000 years. At Gabarnmung, Roberts will measure the date of individual quartz grains that were buried together with the painted rock fragment. He told me, "I've been waiting 20 years to get back to that region. This is where all the action is happening."

Scientists believe the top bird in this painting – discovered by Chris Morgan and Ray Whear in Jawoyn country in western Arnhem Land, in 2008 – is probably a giant 'thunder bird', *Genyornis newtoni*. This species is thought to have been extinct for 45,000 years.

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ALAN FINKEL

With time on their minds: three of the key archaeologists with a keen interest in Gabarnmung, both professionally and aesthetically. Bruno David (centre) from Melbourne's Monash University is flanked by colleagues Jean-Jacques Delannoy (right), from the Université de Savoie, in France, and Jean-Michel Geneste, from the Université de Bordeaux 1, also in France.

"You can easily see why Aborigines have lived here from time immemorial," observes *Cosmos* contributor Elizabeth Finkel, who was given rare access to Gabarnmung for this story.