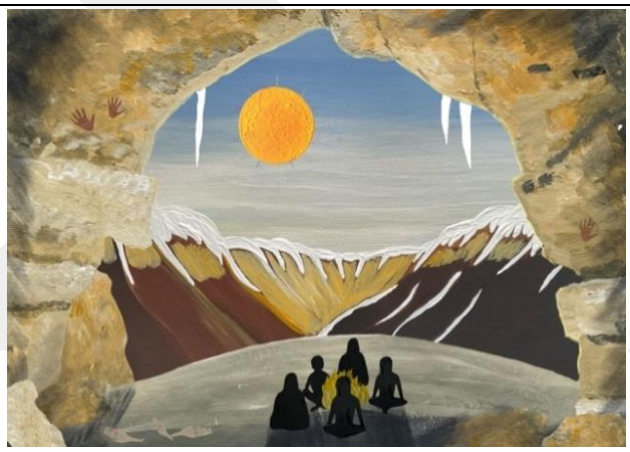
Cold Comfort: Australia's Oldest Occupied Ice Age Cave Found at High Elevation in Blue Mountains

New evidence overturns theory that high country was unoccupied during Ice Age



Artist impression of the ancient ice age cave. Painting by Dharug artist, Leanne Watson Redpath

Sydney, 17 June, 2025: Archaeologists from the Australian Museum, the University of Sydney and the Australian National University in collaboration with First Nations community members who hold cultural connections with the Blue Mountains have unearthed 693 stone artefacts dating from the last ice age to the recent past. Found in an ancient Blue Mountains cave, known as Dargan Shelter, this new evidence provides definitive proof of repeated occupation in this once frozen high-altitude landscape. The research, funded by the Australian Museum Foundation, is published today in *Nature Human Behaviour.*

Dating back 20,000 years, when the upper reaches of the Blue Mountains were treeless and seasonally frozen over, Dargan Shelter at 1073m elevation is believed to be the oldest occupied high-altitude landscape in Australia. Until now, researchers thought the Australian high country was too difficult to occupy during the last ice age. However, the new archaeological results provide the first evidence of repeated human activity and adaption to periglacial environments on the Australian continent.

Gomeroi knowledge holder and First Nations Mentor in archaeology at the University of Sydney, Wayne Brennan, who is a rock art specialist, initiated the research to bring scientists and community together to explore the cultural history of the Blue Mountains to improve conservation outcomes for this important cultural landscape.

Brennan and lead author, Dr Amy Mosig Way, who holds a joint position as archaeologist, Australian Museum and academic lecturer from the Discipline of Archaeology, University of Sydney, worked closely with First Nations members from the Dharug, Wiradjuri, Dharawal, Gomeroi, Wonnarua, and Ngunnawal groups, who hold traditional connections to this region.

Dr Way said the research indicates that First Nations' ancestors were able to navigate and occupy high-altitude periglacial environments.

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"This new evidence now aligns Australia with global data showing that glacial landscapes were not necessarily natural barriers to early human movement and occupation," Dr Way said

"Until now, we thought the Australian high country was too difficult to occupy during the last ice age. Yet, despite the harsh conditions, our research demonstrates people were moving in and through this high elevation landscape, which is approximately 400m above the treeline," Dr Way said.

Second author, Professor Philip Piper, School of Archaeology and Anthropology, Australian National University said the excavations uncovered an incredible layer of evidence of human activity including hearth features.

"It was the excellent state of preservation that enabled us to construct such a robust chronology for Dargan Cave spanning the last 20,000 years," Professor Piper said.

First Nations custodians, authors on the research paper and proud Dharug women, Leanne Watson Redpath and Erin Wilkins explained that their communities have lived in the Blue Mountains for thousands of years.

"Our people have walked, lived and thrived in the Blue Mountains for thousands of years and we knew the cave was there. It is not only a tangible connection to our ancestors who used it as a meeting place for sharing, storytelling and survival, but is a part of our cultural identity. We need to respect and protect our heritage for the benefit of all Australians," Watson Redpath explained.

"While there's no certain way of identifying which groups accessed the mountains in the deep past, it is likely that multiple groups were connected to this country. Today, Dargan Shelter is considered by local custodians to represent a family space of high cultural significance," Wilkins added.

"The Blue Mountains is a UNESCO World Heritage listed site for the protection of flora and fauna but there are no safeguards for our cultural heritage. We hope that by combining our traditional knowledge with scientific research, we can protect these invaluable storehouses of our history for generations to come," Brennan added.

Dr Way said the study builds on research conducted by Australian Museum archaeologists, beginning with Frederick McCarthy in 1935, Professor Paul Taçon and most recently Dr Val Attenbrow and augments previous findings and collections within the Australian Museum. The exact location of the cave will remain unidentified to protect its cultural significance.

-ENDS-

MEDIA NOTE

- Research paper, Photos and footage here
- Please acknowledge members from the Dharug, Wiradjuri, Gomeroi, Darkinjung, Dharawal, Wonnarua, Guidinger groups, who hold traditional connections to this region.
- Declaration: This research was funded by the Australian Museum Foundation

INTERVIEWS

- Dr Amy Mosig Way, research archaeologist from the Discipline of Archaeology at the University of Sydney and Australian Museum
- Wayne Brennan, Gomeroi knowledge holder and First Nations Mentor in Archaeology at the University of Sydney who is a rock art specialist
- Leanne Watson Redpath, Dharug knowledge holder, Erin Wilkins, Dharug knowledge holder

MEDIA ENQUIRIES

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FACT SHEET

KEY POINTS:

- Archaeologists working with local First Nations groups have found the oldest human occupied Pleistocene site at high elevation (1073m) in the Blue Mountains, west of Sydney
- The discovery indicates the cold climate at high elevation was not a barrier to human movement
- These results align the Australian continent for the first time with global findings that cold climates did not prevent people from travelling and making shelters at these altitudes
- Human artefacts, such as stone tools for cutting or scraping, and a sandstone grinding slab that may have been used for shaping wooden artefacts (needles, awls, or bone points for spears), were found in the ancient layers
- The Blue Mountains, home to some of the oldest known rock shelters in Australia, have been inhabited for over thousands of years and this is the highest cave found with human activity, dating back to 20,000 years.

DARGAN SHELTER IN THE UPPER BLUE MOUNTAINS

The Dargan Shelter, a large rock shelter on Dharug Country in the upper Blue Mountains near Lithgow, NSW.

It is the highest elevation Pleistocene site identified in Australia. High elevation is defined as above 700 metres. It is believed to be the oldest human occupied site in Australia at high elevation (1073m), dating back to the Pleistocene when the Blue Mountains were frozen over.

It is below the modern subalpine zone in forest made up of tough-leaved eucalyptus trees, such as the blue gum, scribbly gum and mountain ash. Underneath the eucalyptus canopy, there is a variety of hardy shrubs, including banksias, wattles (acacias), and grevilleas.

Dr Way said it is possible the Dargan Shelter was a meeting place or a ceremonial site for people crossing the mountains from east to west and vice versa or for people spending substantial time travelling along the mountain range during the slightly warmer months.

“People may have used the site as a stopover point while travelling to undertake ceremony or to access resources not found at lower elevations,” Dr Way said.

“While there’s no certain way of identifying which groups accessed the mountains in the deep past, it is likely that multiple groups were connected to this country.”

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THE STUDY

New research published in *Nature* has found evidence of human occupation in an ancient rock shelter during the last ice age. The rock shelter, named the Dargan Shelter, is a high altitude (1073m) cave in the upper Blue Mountains, near Lithgow, indicating human occupation first occurred there around 20,000 years ago during the last ice age. It is the highest elevation Pleistocene site identified in Australia.

Dr Amy Mosig Way led a team working closely with Dharug community members, and First Nations custodian Wayne Brennan, who is a rock art specialist and PhD candidate in archaeology at University of Sydney. The team discovered 693 stone artefacts, a small amount of faded rock art, including a child-sized hand stencil and two forearm stencils.

THE BLUE MOUNTAINS

People have lived in the Blue Mountains for more than 30,000 years adapting to multiple episodes of extreme climate change, including the last ice age. The mountains are home to some of the oldest known rock shelters in Australia.

However, the nature and extent of occupation in this region remains poorly understood in contrast to the better-known coastal areas.

In the ice age there were no trees, it was ~8 degrees cooler than today and water sources were frozen solid over winter. In the warmer months, there may have been a cold grassland tundra supporting mammals and birds.

ABORIGINAL PEOPLE TODAY IN THE BLUE MOUNTAINS

Today, Wiradjuri, Gomeroi, Darkinjung, Dharawal, Wonnarua, Gundungara and other groups hold traditional connections to this region.

First Nations custodian, Wayne Brennan, said the Dargan Shelter is considered by local custodians to represent a family space of high cultural significance.

“The Blue Mountains are very important because what we have here is cultural heritage, through deep time, still intact in its natural environment,” Brennan said.

Stone artefacts found

A total of 693 stone artefacts were excavated across the three visits from April 2022 to March 2023. Many were stone tools possibly used for cutting or scraping. Most of the claystone tools were made locally but one came from the Jenolan caves area and another from the Hunter Valley region, indicating people were travelling from the north and south.

A notable late Pleistocene artefact was a sandstone grinding slab which dated to 13,000 years ago. It had two linear grooves characterised by distinctive abrasive wear consistent with shaping by abrasion of bone or wooden artefacts such as needles, awls, bone points and nose points.

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A notable early Holocene find (post ice age) was a basalt anvil. It consisted of a split river pebble with distinctive sub-circular patch and impact marks consistent with cracking hard woody nut and seed shells.

Cold climate

High-altitude mountains pose many challenges for people to move around in. “Globally, new deep-time studies are changing how we think about these areas,” said Dr Way. “But in Australia, we still don’t know when people first lived in the cold, icy parts of the mountains. Research in Tasmania and the Australian Alps has only found evidence of people living at altitudes above the periglacial limit in the Holocene period. During the earlier Pleistocene period, researchers believed people only lived at lower, less icy elevations.”

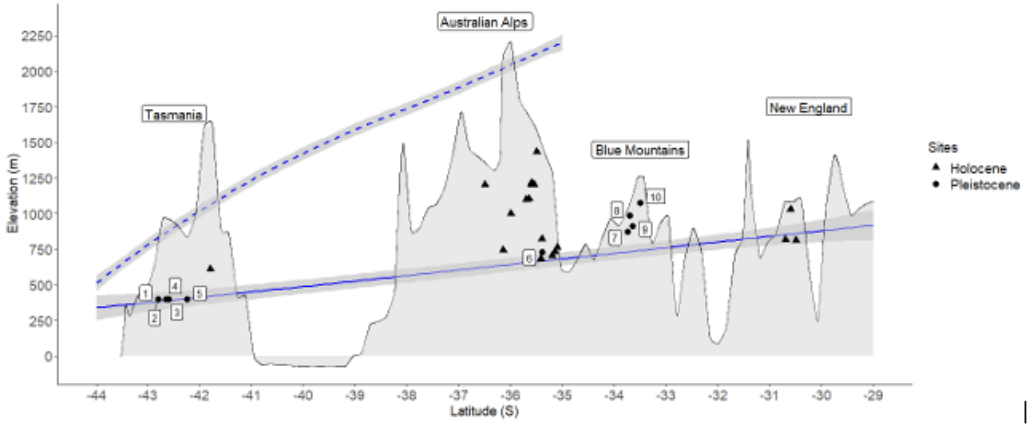

Fig. 1. Holocene and Pleistocene sites in eastern Australia with an elevation at or above the periglacial limit.

During the ice age, periglacial conditions extended to the upper reaches of the Blue Mountains above 600 metres and temperatures would have been at least 8.2 degrees cooler than today with vegetation sparse. Pollen analyses, although with low counts, indicate no tree pollen at the site and regional pollen records indicate the tree line was 400 metres below the site. Little firewood would have been available locally and water sources would have been frozen through winter.

Despite these challenges, there is now a growing body of evidence for high-altitude Pleistocene human occupation in the Blue Mountains.

The Dargan Shelter findings from archaeologists at the Australian Museum and the University of Sydney, provide the oldest evidence of occupation above 700 metres in Australia, and the first site with definitive evidence for repeated occupation well above the tree line during the last ice age

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BACKGROUND FOR INTERNATIONAL MEDIA

The Greater Blue Mountains area is a UNESCO World Heritage site made up of one million hectares of national park and wilderness dominated by temperate eucalypt forest. The area supports exceptional biodiversity including a number of rare plants. It is also highly valued for its Aboriginal heritage and outstanding geological features, such as 300m high sandstone cliffs, slot canyons and waterfalls. Within easy reach of Sydney, visitors can take in the scenic views from lookouts or explore the wilderness via walking tracks or cycling trails. Learn more here from the National Parks NSW government site.

ABOUT THE AUSTRALIAN MUSEUM

The Australian Museum (AM) was founded in 1827 and is the nation's first museum. It is internationally recognised as a natural science and culture institution focused on Australia and the Pacific. As custodian of more than 22 million objects and specimens, the AM is uniquely positioned to provide a greater understanding of the region through its scientific research, exhibitions, and public and education programs. Through the Australian Museum Research Institute (AMRI), the AM also plays a leading role in conserving Australia's biodiversity through understanding the environmental impacts of climate change, potential bio-security threats and invasive species. Visit Australian Museum for more information.

ABOUT UNIVERSITY OF SYDNEY

The University of Sydney is one of the world's leading, comprehensive research and teaching universities. We offer an exceptional range of disciplines – more than 400 areas of study – and our community includes more than 70,000 students, 8000 permanent and fixed-term staff and 350,000 alumni in more than 170 countries. Leadership has always been at the core of our values. We were one of the first universities in the world to admit students solely on academic merit, and to open our doors to women on the same basis as men. Our aim is to make lives better not just by producing leaders of society, but through equipping our people with the qualities that allow them to serve all of our communities at every level. In creating the first university in Australia in 1850, our founders recognised the power of education to inspire positive change. We hold that belief just as strongly today. Currently ranked 18th in the global QS World University Rankings, the University of Sydney is also consistently placed among the top universities in the world. Learn more

ABOUT DHARUG COUNTRY

Dharug clan lands embrace the land, rivers and sea. From the Blue Mountains to the ocean, from the Hawkesbury in the North, and as far as Appin in the South. The ancestors of Darug, Darkinyung and Gundungurra people have lived in this region for around 50,000 years. Their histories, cultures and spiritualties are inseparable from their river Country.

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