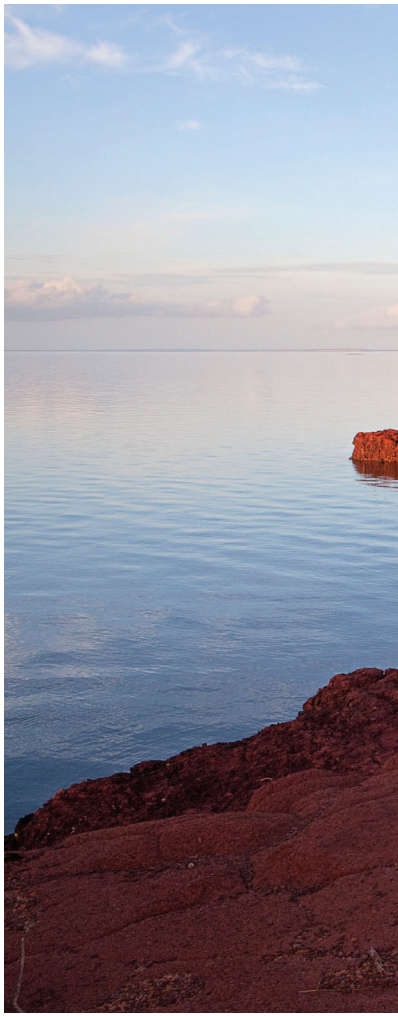
Finding Sahul

How did Stone Age people reach the far-flung continent that contained Australia? It was no accident, discovers **Graham Lawton**



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FOOTPRINTS in the sand marked the beginning of the end of an epic journey. They were left fleetingly on a mangrove-fringed beach in south-eastern Asia some 65,000 years ago, when a group of humans lashed together a bamboo raft in the hope that it would carry them over the horizon.

They eventually washed up on the shores of Sahul, a lost continent made up of Australia, New Guinea, Tasmania and a lot of what is now seabed. This was the final destination of the out-of-Africa dispersal that had already peopled much of southern Eurasia. But it wasn't just another stepping stone. Sahul was far offshore, requiring a voyage of many days across a chain of islands separated by deep, open sea, sometimes with little sight of land.

Exactly how these ancient people did it remains a mystery. The waters around the island groups they would have navigated are treacherous, and it has long been assumed that early humans didn't have the necessary tools, mental or maritime. "It's the equivalent of sending a spaceship to the moon," says Michael Westaway at the University of Queensland in Australia. "There's nothing comparable in human evolution at that time."

Until recently, scholars tended to think that the crossing was accidental. But new evidence suggests more strongly than ever that it was planned, perhaps involving thousands of people, many rafts and great seafaring skill. If we get a better idea of the likely route taken, it will allow archaeologists to take their own leap of faith and seek fresh clues to find out how it was done, perhaps solving one of the great puzzles of the human conquest of the world.

When Sahul was colonised, the geography of what is now South-East Asia and Australasia was quite different to how it is today. The world was in the grip of an ice age with huge amounts of water locked away in ice caps and glaciers, so the sea level was up to 85 metres lower. What is now the bottom of the Gulf of Carpentaria off northern Australia was dry land; the submerged Sahul Banks in the Timor Sea off Western Australia were coastline.

Distances were different too. These days, the journey from the southernmost tip of Asia to Australia is 463 kilometres. Back then it was just 90 kilometres. But even that is a long voyage, especially for people with only the most basic kit.

Roughly 60,000 years is about as far back as you can go before our ancestors stop being fully human. It is about the time they became "behaviourally modern", possessing language, symbolic behaviour, abstract thinking and creativity. But technologically and socially, they were still firmly in the middle Stone Age: nomadic hunter-gatherers with flint tools but no pottery, metal, agriculture, axes, wheels or domestic animals.

That goes a long way to explaining why, until recently, the prevailing view was that the sea crossings between Asia and Sahul presented such an obstacle that deliberate migration was unthinkable. People must have arrived on the currents after being washed into the sea by a tsunami or flood, perhaps clinging to a mat of floating vegetation or a raft of pumice.

This so-called "sweepstake colonisation" is often invoked to explain how terrestrial reptiles and mammals make it onto distant tropical islands, and it could plausibly account for the peopling of Sahul. Prevailing ocean currents are favourable and any floating castaways caught in them would have found the vast Sahul "hard to miss", according to archaeologist Jane Balme at the University of Western Australia in Perth.

Rocky Point in Arnhem Land, Australia, was part of the interior when the first humans arrived

However, such scenarios are increasingly seen as unlikely – for two main reasons. Archaic humans, notably *Homo erectus*, were present in south-eastern Asia for the million years before people turned up in Sahul, but there is no evidence of them ever reaching the continent during that time. The same goes for the region's other large-bodied mammals. The other reason is demographic: even if people were accidentally swept alive to Sahul, they were vanishingly unlikely to have arrived in sufficient numbers to start a viable colony.

Admittedly, deliberate colonisation also seems implausible. "Nobody has put the question to bed," says Michael Bird at James Cook University in Cairns, Australia.

One problem with working out how humans arrived in Sahul is that the timing is hazy. The ancient archaeological record is sparse, says Bird, perhaps because colonists stuck to coastal regions that are now under water. The oldest known site is a rock shelter called Madjedbebe in Australia's Northern Territory. In the 1970s, archaeologists dated it to around 50,000 years ago. The most recent excavations have pushed that back to 65,000 years, give or take five millennia, though these claims aren't universally accepted. The oldest undisputed date is 47,000 years ago.

But the idea that humans could have been in Sahul some 70,000 years ago is looking increasingly plausible. A recently discovered settlement on the Indonesian island of Sumatra – a possible staging post on the way to Sahul – is roughly that old, and a 2016 analysis of Australian Aboriginal DNA also points in the same direction.

In which case, the journey looks slightly less daunting. Sea level was 10 metres lower 70,000 years ago than it was 50,000 years ago, which would have further reduced the distances involved. That isn't a major factor in Indonesia's Wallacea islands, with their steep coastlines. But the Sahul coast would have been significantly closer to the easternmost of the south-eastern Asian islands.

"How did ancient people even know Sahul was beyond the horizon?"

That doesn't necessarily mean the journey was deliberate, but two fresh lines of evidence seem to support the idea that it was.

The first concerns the route taken by the colonists. Archaeologists have long recognised that there were two plausible options (see map, page 40). The northern route begins on the island of Sulawesi, hops across other islands of Wallacea and makes landfall in Sahul on the western tip of New Guinea. The southern route starts on the Indonesian island of Java, which would have been part of the Asian mainland then, traverses the Lesser Sunda Islands to Timor, then either heads south to the coast of Sahul or continues east to the edge of the – now submerged – Carpentarian Plain.

Even at the lowest sea level, both routes require at least one crossing approaching 100 kilometres and several of 20 to 30 kilometres, says Bird. That puts the destination over the horizon. With no knowledge of the curvature of the planet, how did people know that Sahul was even there? It is possible that they climbed headlands or peaks to scan for distant land, ›

Over the horizon

Ancient humans could have reached the lost continent of Sahul from south-eastern Asia via several **possible routes**, most of which require at least one sea crossing in which **no land was visible** at launch

SOURCE: NATURE

"One way to find out if the journey was possible is to recreate it"

or inferred its existence from clouds, smoke, migrating birds or the glow of bushfires. Even so, at some point, it appeared that they would have had to strike out into the unknown.

Both routes have their pros and cons. The northern route has fewer crossings, a shorter overall distance and plenty of the wide-stemmed bamboo that is considered ideal for raft-building. But the islands would have been heavily forested, making it hard to climb to vantage points, and prevailing north-south currents would have made it tricky to maintain the correct heading.

The southern route, by and large, has shorter crossings, although the final legs would have been longer than any on the northern route. The vegetation was savannah, which is better for reaching higher ground but worse for raft-building material. On this route, the ancient mariners would have to have used a material other than bamboo, or perhaps brought stockpiles, both of which seem unlikely.

Deciding which route was more likely depends on a detailed understanding of the ancient ocean currents and climate. Last year, Bird's team used computer modelling to drop virtual castaways at 17 possible crossings, then allow the currents and winds as they would have been 65,000 years ago to do their stuff. This confirmed that the possibility of randomly colonising Sahul is vanishingly small, unless implausibly large numbers of adults were being washed into the sea at unreasonably high frequencies. But it also revealed that throwing in a bit of planning – such as paddling a raft and setting off during optimal weather and currents – dramatically increases the chances of success.

Planned migration

Bird's team also reanalysed visibility along the two routes. Contrary to previous work, they discovered a number of ways of navigating from south-eastern Asia to Sahul without ever losing sight of land. All of these are on a northern route, which affords uninterrupted views of the high mountains of New Guinea; for the southern route, all of the final crossings would have had no sight of land. This doesn't rule out the southern route, says Bird, especially when sea level was very low and there were islands south of Timor. But it does suggest that the assumption of a complete leap into the unknown no longer holds water.

The other new line of evidence supporting a planned migration comes from Corey Bradshaw of Flinders University in Adelaide, Australia, and his colleagues. They modelled the demographics of colonisation, taking account of typical hunter-gatherer fertility rates and longevity and the ecological conditions they would have encountered after landing in Sahul. The calculations revealed that the minimum founding population was 1300 people, perhaps all at once or in smaller groups over many years, which all but rules out accidental colonisation.

The peopling of Sahul was "probably planned", Bradshaw concludes. Bird agrees. "It is not feasible that people randomly got there," he says. "They had to think about it and they came in large numbers." Why they came is a different question. But the chances are they were driven by dwindling resources, or simply the lure of the unknown, says Bird.

And yet the mystery isn't quite put to bed, says Westaway, because although the new analyses are useful, only archaeology and genetics can give us the full story. "What we are missing is ancient genomes from Sahul," he says. These would tell us not only when people arrived in Sahul with more certainty, but also whether those people were related to the

people we know were present in south-eastern Asia around the same time (see "Only humans?", below).

The trouble is that the majority of Sahul, now northern Australia, is desert. "Arid conditions are not good for the preservation of Pleistocene human DNA," says Westway. "If we're going to find it, I think it will have to come from the highlands of New Guinea, but that would require new excavations."

As for the archaeology, Bird's colleagues are carrying out high-resolution surveys of areas of Sahul that are now underwater, looking for potential sites of early human occupation. Again, though, that would require new excavations, this time on the seabed. "Underwater archaeology gets very expensive," says Bird.

For the time being, the prospects for new archaeological discoveries seem remote. When it comes to understanding how such ancient humans were able to navigate to a new continent, we are in the realms of speculation, says Westaway.

What we do know is that the minimum requirement is a raft of some kind, probably made from bamboo lashed together with plant fibres. But could a fleet of such rudimentary vessels really carry hundreds of people safely from Asia to Sahul?

One way to find out is to recreate the journey, which is exactly what an experimental archaeology project called The First Mariners is designed to do. The researchers behind the project are now on the southern tip of the Indonesian island of Rote, building a raft using stone tools and locally available materials, principally a giant bamboo known as betung which can reach 20 metres or more in height. "Almost nothing challenges bamboo for weight, strength, durability, availability, resistance to seawater and its extraordinary flotation properties," says project director and maritime historian Bob Hobman.

RAY WISE/GETTY IMAGES

The first mariners probably voyaged across the sea on bamboo rafts

About 250 stems will be lashed together to create a platform 18 metres long and 4 metres wide. The deck will be supported by cross timbers foraged from the forest and held together with around 17,000 metres of rope made from the bark of the sugar palm (*Arenga pinnata*). Basic steering will be provided by a rear oar, and the giant leaves of the lontar palm (*Borassus flabellifer*) will form a rudimentary sail. "It's our secret weapon," says Hobman. "It's really not a sail, but it gives wind assistance. It's unsophisticated, but it will do the job."

And that is essentially it. The plan is to set off across the Timor Sea in early February when the north-westerly monsoon wind will be "fizzing", Hobman says. The journey will take about 14 days, although they will cross the drowned coastline of Sahul after about six. The 10-strong crew will live mainly on fish and monsoon rain. A support vessel will follow in case they get into difficulty in the shark-infested waters, but exactly what will happen is in the lap of the gods. "It's totally experimental," says Hobman. "And it will be from the moment we leave, all the way across the Timor Sea." But Hobman says he is confident of success – because he has almost done it before.

In 1998, he was part of a crew that sailed a bamboo raft called Nale Tasih 2 from Timor to within spitting distance of Australia, before they were forced to abandon ship in heavy seas. That voyage took 13 days, but used more advanced technology than was available in the middle Stone Age, including modern tools to build the boat and a woven sail.

This time the ancient mariners are going full Palaeolithic. If they make it, it won't prove that Palaeolithic humans really did navigate to Sahul; that we may never know. But it will mean we can no longer say that it was "impossible". As soon as humans were fully human, we didn't know the meaning of the word. ▮

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Only humans?

South-eastern Asia 60,000 years ago was a melting pot of archaic humanity. As well as our own species, there were at least three other hominins in the area: *Homo floresiensis* (nicknamed the hobbit), the recently discovered *Homo luzonensis* in the Philippines and the mysterious Denisovans. There is no archaeological evidence that any hominin other than our species made the challenging sea journey from south-eastern Asia to the continent of Sahul (see main feature), but genetic evidence suggests it happened.

From sequencing modern human DNA, we know that there were at least two interbreeding events between our ancestors and Denisovans in the south-eastern Asia/Sahul area. One can be pinpointed to somewhere between Sumatra and Borneo, but the other is centred on New Guinea, which was part of Sahul.

This second event would mean we have another mystery to solve: how and when did Denisovans get to New Guinea, and does that indicate that they were capable of sea voyages? "We know so little about them," says Michael Westaway at the University of Queensland in Australia. "Denisovans in New Guinea would be a game changer."