

# Looking for the ancestors

The scientists who discovered a new species of human in Indonesia last year are now back, looking for the bones that will flesh out their theories. Rex Dalton joins them.

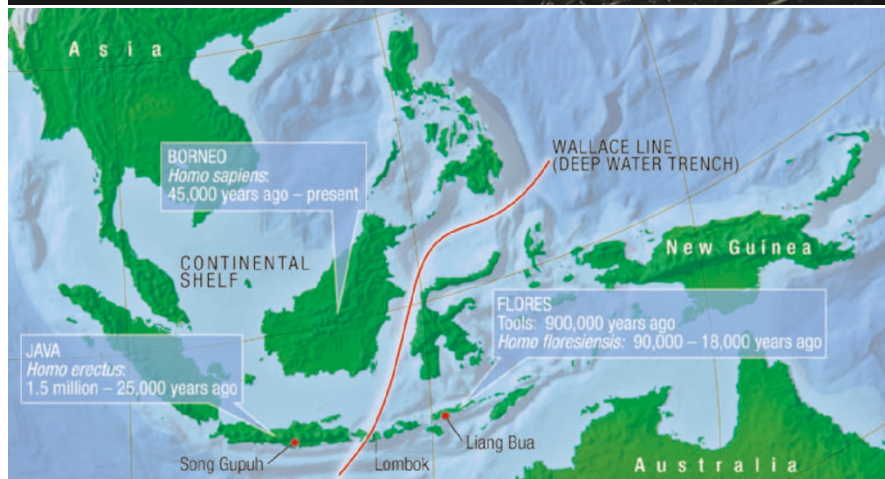
In a limestone cave on Java, sheltered from the monsoon rain that patters on the jungle leaves outside, a neatly dug shaft drops into the floor. Descending a bamboo ladder, workers disappear into the shadows to reinforce the pit's wooden supports. The archaeologists are anxious to begin extracting earth and, they hope, bones of hominins — species from the same family as modern humans. But first they have to pull out a huge rock that blocks their progress some five metres down — probably part of the ceiling that collapsed maybe 50,000 years ago. Thomas Sutikna surveys the situation with his colleagues from the Indonesian Centre for Archaeology. Gazing into the shaft, team co-leader Michael Morwood of the University of New England, Australia, dreams of the treasures that may lie beneath. "I think we have some very old material under this," he says.

Last year, this same group of Indonesian and Australian archaeologists electrified the world with their report of the discovery of a miniature human species, *Homo floresiensis*, which lived on the nearby island of Flores at least as recently as 18,000 years ago<sup>1</sup>. This new hominin, whose near-complete specimen was called LB1 and nicknamed 'hobbit' by some of the finders, represents a totally unexpected branch of the human evolutionary tree. The team is now hoping to unearth a similarly startling new find — the ancestors of *H. floresiensis*.

But a tense political backdrop may make the fieldwork difficult. At least one prominent Indonesian scientist publicly disputes the team's original description of the find; against prevailing opinion he says that the specimens do not represent a new species. And the discovery team claims that after



Digging deep: archaeologists search for traces of *Homo floresiensis*' ancestors in Song Gupuh cave.



he took the bones for study, they were returned in a damaged state that may hinder further analysis.

All this is enough to make the team seek a place of solace. So it is perhaps fitting that the researchers are currently digging in a cave called Song Gupuh (pronounced song-ga-poo) — 'flee cave' in English.

Here, in a cave where generations of people have sought refuge, the team is trying to

put controversy aside to concentrate on the next chapter of its research. The goal is to identify a transitional species — the hominins who later evolved into the hobbit's clan.

This should help anthropologists understand from whence *H. floresiensis* came, and perhaps how it acquired such a baffling mix of features: a metre-tall stature, ape-like arms and a small brain, but sufficient intelligence, seemingly, to make and use stone tools.

The cave is promising: it is very habitable, with water nearby and a good view of incoming predators. And it holds a deep accumulation of sediments, which may extend back some 100,000 years.

In some ways Song Gupuh is similar to Liang Bua, or 'cool cave' — the shelter where *H. floresiensis* was found nearly six metres under the floor. Both caves were partially excavated by an earlier generation of Indonesian researchers, before Morwood and his colleagues brought their teams to dig more extensively.

### Crossing the line

But Song Gupuh is also markedly different. Java lies on the western side of a 350-metre-deep undersea canyon, which played a crucial role in humanity's trek out of Asia. During glacial periods, tens or hundreds of thousands of years ago, ice covered much of the upper globe; the ocean level was so low that early humans could walk to Indonesian islands such as Java on the exposed shelf (see map). But Flores, along with other eastern islands, was isolated by deep water. Early humans could only reach these islands using some form of watercraft.

This isolation may help to explain why the features of *H. floresiensis* are so distinct. The species is thought to have grown small because of a lack of resources on the island. Fossils in the Liang Bua cave show that other animals were subjected to similar pressures: alongside the hominins, the remains of pygmy elephants were found.

However, the watery trench — named the Wallace Line after Alfred Russel Wallace, a contemporary of Charles Darwin who first noted the marked differences between animals living either side of it — also poses a problem. No one knows how hominins in early periods crossed the open water. During a ferry ride across the choppy waters of the Wallace Line to Lombok, Morwood marvels at the feat. "Do you think you could make it across here in a raft?" he asks.

It was this conundrum that first brought Morwood and his colleagues to the area. In 1996, Morwood's team reported stone tools at a site on Flores called Mata Menge. The site was dated to 900,000 years ago<sup>2</sup>, which is long before the period when anthropologists thought that sophisticated hominins lived there.

Morwood established a collaboration with researchers from the Indonesian Centre in Jakarta, including Sutikna. By looking for fossils on both sides of the Wallace Line, Morwood and his colleagues hoped to learn who made it across the water, when they got across, and possibly even how. One good candidate was *Homo erectus*, who is thought to have survived on Java until as recently as 25,000–50,000 years ago<sup>3</sup>.

By 2001, Morwood and his Indonesian colleagues were returning to caves that had been explored in previous decades by Radien Soejono, the senior archaeologist at the Indonesian Centre. Now 78, Soejono has ceded fieldwork to younger Indonesian colleagues. But he remains a national political and scientific force, and he was made co-chief investigator of the team with Morwood.

During the summer dig season in 2003, the researchers hit the big time at Liang Bua when they uncovered the LB1 specimen. Their original question about who made the 900,000-year-old tools paled in comparison. Everyone on the team was ecstatic — but their work set in motion rivalries in Indonesia that continue today.

Within days of the Liang Bua specimen's extraction, Soejono sought to have the bones transferred to the laboratory of his long-time colleague Teuku Jacob, a palaeoanthropologist at Gajah Mada University in the old Javanese capital of Yogyakarta.

Initially trained as a physician, Jacob went on to get degrees in anthropology in the United States and Holland. By the 1970s, his lab was the prime Indonesian location for anthropological studies. Soejono and Jacob both lived through the Japanese occupation of the Second World War. Soejono is famous for surviving an attempt to tear down a Japanese flag in front of gun-toting soldiers. Later, when a student army helped to drive out the Dutch colonial regime in 1949, Jacob was the students' voice on the lone radio station.

Both he and Soejono are national icons, with access to the presidential palace.

But Jacob is also an extremely proud individual, sensitive to hints of colonialism. Over the years, Indonesia has drawn international researchers to examine its geological and anthropological riches. Some of these visiting researchers have caused difficulties, at times taking too much credit for their discoveries. Jacob finds such behaviour insulting and has reacted negatively. Such dynamics have prompted some leading anthropologists to steer completely clear of Indonesia.

Somewhat scientifically isolated, the 75-year-old Jacob has continued to adhere to the theory that hominin species from multiple regions around the globe evolved into a single line that produced modern *H. sapiens*. In this theory, Neanderthals were direct

ancestors of modern humans, but most studies have shown that they were not related to *H. sapiens*. The 'multi-regional' theory has virtually no support among the world's leading anthropologists.

Instead, the prevailing view is that modern humans first evolved less than 200,000 years ago in eastern Africa, and spread across Europe, Asia and the available land bridges, becoming the dominant species. Reports of a human relative that existed 7 million years ago in Chad<sup>4</sup>, and a 160,000-year-old subspecies of *H. sapiens* in Ethiopia<sup>5</sup> have strengthened this 'out of Africa' hypothesis. The finding of *H. floresiensis* fails to support the multi-regional theory because there is no evidence that it contributed to the *H. sapiens* line. But Jacob and his allies remain unconvinced.

Their beliefs may even have affected Morwood's fieldwork. Following the discovery of LB1, the Indonesian Centre archaeologists excitedly sought more bones to ensure that the specimen wasn't just an individual with unusual characteristics. But last August, Soejono tried to pull the young Indonesian researchers out of Liang Bua cave. He claimed he wanted the team to help prepare for a scientific conference, but team members were not convinced by this explanation, and found the interference unhelpful.

In the end, Morwood's arguments to keep the researchers digging were successful, and the bones of a total of eight separate *H. floresiensis* individuals were unearthed. Buried at the same site was an unusual set of flaked stone tools<sup>6</sup>.

### Hand overs

In November, just after the publication of *H. floresiensis*' description, Soejono independently signed agreements to hand the specimens over to Jacob, who wanted to examine them himself. "We thought we would never see them again," says Morwood. Peter Brown, the lead author on the paper announcing the discovery, "worked furiously to take measurements and pictures before they were taken away", adds Morwood.

Jacob held on to the specimens for two months longer than was originally agreed, saying he needed more time. After repeated requests, all but two leg bones were returned on 23 February 2005 (see *Nature* 434, 5; 2005). Soejono says he was confused by the situation, caught between the desires of

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REASONS

Unearthing the hobbit's ancestor  
may help explain its small stature.

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— Michael Morwood



his scientific peer and those of the younger scientists. "My students were angry," Soejono laments.

Jacob also shared access to published and unpublished material with other researchers, including Alan Thorne, a long-time professional antagonist of Brown and a semi-retired palaeoanthropologist from the Australian National University in Canberra.

After their analysis, Jacob and Thorne publicly declared that *H. floresiensis* was not a new species. They believe the specimens are of a tribe of pygmies, one of which has the congenital disorder microcephaly — a disease that causes a smaller skull and brain. They hold to this position even after such a disorder was largely ruled out by imagery of the skull<sup>7</sup> published last month by US researchers who collaborated with the discovery team.

Putting such criticism behind them, the team this month turned its attention to the condition of some of the most important bones. The researchers believe that efforts to make casts at Jacob's lab, along with the trauma of transport, led to significant damage. Parts of the skull were pulled off, they say, and a jaw was

broken between the front two teeth, splintering an area crucial for future analysis. "There was no reason to make casts of such fragile bones," says Brown, noting that computerized X-ray images are just as useful. There was even an attempt to force pieces back together with glue, he says, and the pelvis of LB1 was crushed. "This callous treatment of hominin material of world importance is just sickening," says Morwood. Jacob declined a telephone interview with *Nature*, although he has denied damaging the fossils to others.

### Remains of the day

While the damage is assessed and further work is done on the bones, Morwood and his team are trying hard to look forwards to future discoveries.

So far, they are no closer to answering their original questions about who crossed the Wallace Line and when. Their excavations have shown that *H. floresiensis* was on Flores as early as 90,000 years ago<sup>6</sup>, and researchers have shown that other hominins were around at the same time. While *H. floresiensis* thrived, *H. sapiens* was living on nearby Borneo and *H. erectus* could be found in Java. But a clearer picture of the relationship between these different species is still elusive.



Cave spotting: Douglas Hobbs (left) and Michael Morwood crossing the Wallace Line on a ferry to Lombok to investigate possible dig sites (above).



Analysing DNA from the bones can help to determine a species' lineage. But first one has to find non-degraded genetic material, which the discovery team has not yet been able to do. A

team at the Max Plank Institute for Evolutionary Anthropology in Leipzig, Germany, is also looking for DNA, in a piece of rib supplied to them by Jacob. The experiments are currently under way.

In the meantime, Morwood and his team will spend the coming season digging in locations dictated by the monsoons. In February they began at Song Gupuh, which will stay dry no matter how hard it rains; they will move on as the monsoon recedes.

If Morwood's team finds more bones of *H. floresiensis* at Liang Bua, they will strengthen the published case. Multiple skulls with the distinctive small size will quieten even their most outspoken critics. But how many would they need to find? When asked face-to-face, Jacob hesitates for a moment, before saying: "Two or three? No. But if there were more, I might reconsider." He's on safe ground — finding such a trove of ancient skulls is basically unheard of.

Even finding good caves in which to look is proving tricky. After taking the ferry to Lombok, Morwood and fellow Australian Douglas Hobbs set off to follow a tip from an archaeologist friend. They found the cave he had spotted while on a surf trip. Saung Batu,

as it is called, is ideal for human habitation: spacious, dry and accessible. Inside, there is a rock used by some ancient folk for grinding seeds, and nearby rests a spear point. But the cave isn't suitable for a major dig. "The sediment doesn't look deep enough," proclaims Morwood.

In the months ahead, the team knows there may be more serious obstacles to its work than bad luck. The researchers must tread softly when challenging the greybeards of Indonesian science; no one wants to stir political animosity that might block exploration permits.

So far, the Australian team members have the backing of Tony Djubiantono, director of the Indonesian Centre for Archaeology, which issues permits. And the young Indonesian researchers are enthusiastic about their partnership with the Australians, grateful for the funds, training, patience and goodwill

brought to the project.

But these young Indonesians, eager to lead the team to the forefront internationally, must contend with their scientific elders. "It is not the Indonesian way" for the young to lead, Soejono has told them. Those researchers who know the potential for Indonesian anthropology hope that the way is changing. ■

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1. Brown, P. *et al. Nature* **431**, 1055–1061 (2004).
2. Morwood, M. J. *et al. Nature* **392**, 173–176 (1998).
3. Swisher, C. C. *et al. Science* **274**, 1870–1874 (1996).
4. Brunet, M. *Nature* **418**, 145–151 (2002).
5. White, T. D. *et al. Nature* **423**, 742–747 (2003).
6. Morwood, M. J. *et al. Nature* **431**, 1087–1091 (2004).
7. Falk, D. *et al. Science* published online, doi:10.1126/science.1109727 (2005).