The **Homo floresiensis** Puzzle

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A tiny skeleton was revealed to an unsuspecting world in October 2004 – the bones of a new kind of human that, because it was so small, was nick-named “the hobbit.” The bones were discovered during an archaeological excavation in Liang Bua cave, on the island of Flores in Indonesia. The excavation team of Indonesian and Australian researchers was led by Professor Mike Morwood and Dr Tony Djuibiantono under the auspices of the Indonesian National Research Centre for Archaeology. The excavation aimed to find insights into the origins of the first Australians. No-one could have imagined that it would throw the scientific world into a frenzy of excitement and controversy.

The most spectacular find was at a depth of six meters. It was an 18,000-year-old skeleton of a person just over one meter tall. The skeleton was first named LB1, in reference to the cave in which it was found. The remains included the skull, leg bones, parts of the pelvis, hands, feet, and some other fragments. Judging by the pelvis, LB1 was probably female. Although it is not known how she died, archaeological evidence shows that she had not been deliberately buried but, rather, after death, had sunk into mud in a shallow pool of water where she was slowly covered by silt.

LB1 was not alone. There were 30 other human bones from a number of individuals found throughout the 13-meter excavation. These remains were in stratigraphic levels that have been dated to between approximately 10.2 and 100 thousand years before present. They were all from small individuals. At these levels of the archaeological site, there were no bones from individuals with the stature of modern humans.

When the bones of the diminutive human were first discovered, no one was sure what species they belonged to. It was necessary to compare them with bones of **Homo sapiens** and archaic hominin species. Peter Brown and his co-workers compared the Liang Bua remains with those of Homo erectus, Homo ergaster, Homo georgicus, Homo sapiens, and Australopithecus africanus. They concluded that LB1 showed a mix of archaic and modern characteristics. In this, LB1 was unlike any other species of human. It was declared to be a new species of Homo and given the name **Homo floresiensis**.

This declaration challenged existing paradigms of human evolution. It had been thought that Homo erectus was the earliest hominin to live in the archipelago that is now Indonesia and had been present there about one million years ago. It seemed now that an even more archaic species also lived in this region, but strangely, at a much later time than Homo erectus. Further, **Homo floresiensis** lived on Flores during the period that modern humans were present on nearby New Guinea and Australia, though, as yet, we do not know...
whether the two species were ever present on the same island or land mass at the same time.

And, to add to the puzzles, the fact that Flores has been separated from other land masses from well before the time these hominins originated, suggests that *Homo floresiensis* may have had the ability to make sea crossings. To many people all this seemed unbelievable and the reaction was spectacular. The diagnosis of the bones of LB1 as a new species was challenged immediately. The challenge took many forms but, first, let’s find out what these little humans looked like.

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LB1 and her kind were tiny – only one meter tall, so small that, at first, it was thought that the remains were those of a Homo erectus child. But the jaw had a full complement of adult teeth which suggested that, relative to modern humans, she was the equivalent of about a 30-year-old. As well, *Homo floresiensis* had relatively long arms and long feet. Their wrists and shoulder joints were quite unlike those of *Homo sapiens*. The wrists were more like those of African apes and the hands could not open as expansively as ours. As well, the shoulders faced somewhat forward. They could not rotate as much as ours and, in this, *Homo floresiensis* were more like Homo ergaster, which lived 1.5 million years ago in Africa. They lacked a chin and had a short forehead that sloped backwards. A mound of bone framed the upper and side regions of the orbits. In all these ways, many researchers who examined the bones found at Liang Bua cave depicted *Homo floresiensis* as strikingly distinct from modern humans.

Though they were small and, in many features, unlike modern humans, *Homo floresiensis* walked upright. The opening where the spine enters the skull – the foramen magnum – is positioned in the same place as seen in *Homo sapiens*. If *Homo floresiensis* had walked on all fours the foramen magnum would have been positioned towards the back of the skull. It is unlikely, however, that this diminutive human walked in the way that we do. Her feet are 70 percent the length of her shins; in *Homo sapiens* the ratio is 55 percent. And LB1’s feet are not arched. Bill Jungers and his colleagues of Stony Brook University concluded that when she walked she had to bend her knees more than modern humans do and would never have a won a 100 meter dash, let alone a marathon. And, as she walked, her long arms – shorter relative to leg length than in chimpanzees but, perhaps, proportionately similar to those of very early hominins that lived in Africa two and a half million years ago – lacked the rotational capacity seen in modern humans.

What, though, of likely cognitive abilities? The brain was tiny – the size of a grapefruit. It was similar to that of the Australopithecines which had preceded the advent of the genus Homo and less than a quarter the size of the modern human brain. But absolute brain size does not directly measure the cerebral capabilities of an individual; rather, it is the complexity and organization of the brain that is important. Brains, of course, are not usually preserved in ancient fossil remains, but sometimes marks on the inside of the skull reveal the presence and the form of arteries and of convolutions of the brain. This was the case for LB1. Dean Falk and her colleagues studied these marks and found that the skull of LB1 had housed a relatively large frontal lobe. In *Homo sapiens* this part of the brain is associated with capabilities for planning, for learning from mistakes, and for passing on knowledge from generation to generation. The implication, therefore, is that though *Homo floresiensis* was tiny and had a small brain,
Contemporary understandings are based on a conceptual framework of a ‘branching tree’ in which species of Australopithecines living between about four million and a little over two million years ago were followed by Homo habilis – at about two million years ago – and, subsequently, on different branches, by H. ergaster, H. erectus, H. heidelbergensis, H. neanderthalensis and, finally, H. sapiens. There are debates about the relationships between all these species, and there are debates about possible temporal overlaps in the existence of H. erectus and H. sapiens and of H. neanderthalensis and H. sapiens. But until the discovery of Homo floresiensis it was thought that our species, H. sapiens, had been the sole remaining species of Homo for over 30,000 years.

It is hardly surprising, therefore, that serious disputes erupted immediately after the discovery of Homo floresiensis was announced. The small size of these people and their close anatomical similarity to modern humans, and their discovery in Indonesia, raises questions about the time and place of the origin of modern humans. How did they arrive there? What were their forms of sociality and of child care? Could they have been, or interacted with, Homo sapiens? Did they even survive into more recent times?

These are just some of the questions that have yet to be answered. This is a very exciting time for human evolutionary studies. Homo floresiensis – the ‘hobbit’ as it is so often called – requires that we rethink so much that we thought we knew about human evolution. And that is quite a feat for such a little person.

Notes


About the author: Debbie Argue is an Australian Research Council Postdoctoral Fellow at the Australian National University in Canberra. She is researching the new species Homo floresiensis and, in particular, seeking to identify its ancestors and its place in the human evolutionary tree. Her team comprises Professor Colin Groves (Australian National University) and Professor William Jungers (Story Brook, New York). Her doctorate focused on human evolution in Africa and Europe in the Early Pleistocene; her MA focused on human evolution in the Middle Pleistocene, and, previously, she was an archaeologist specializing in Australian prehistory, particularly of the Australian Alps.