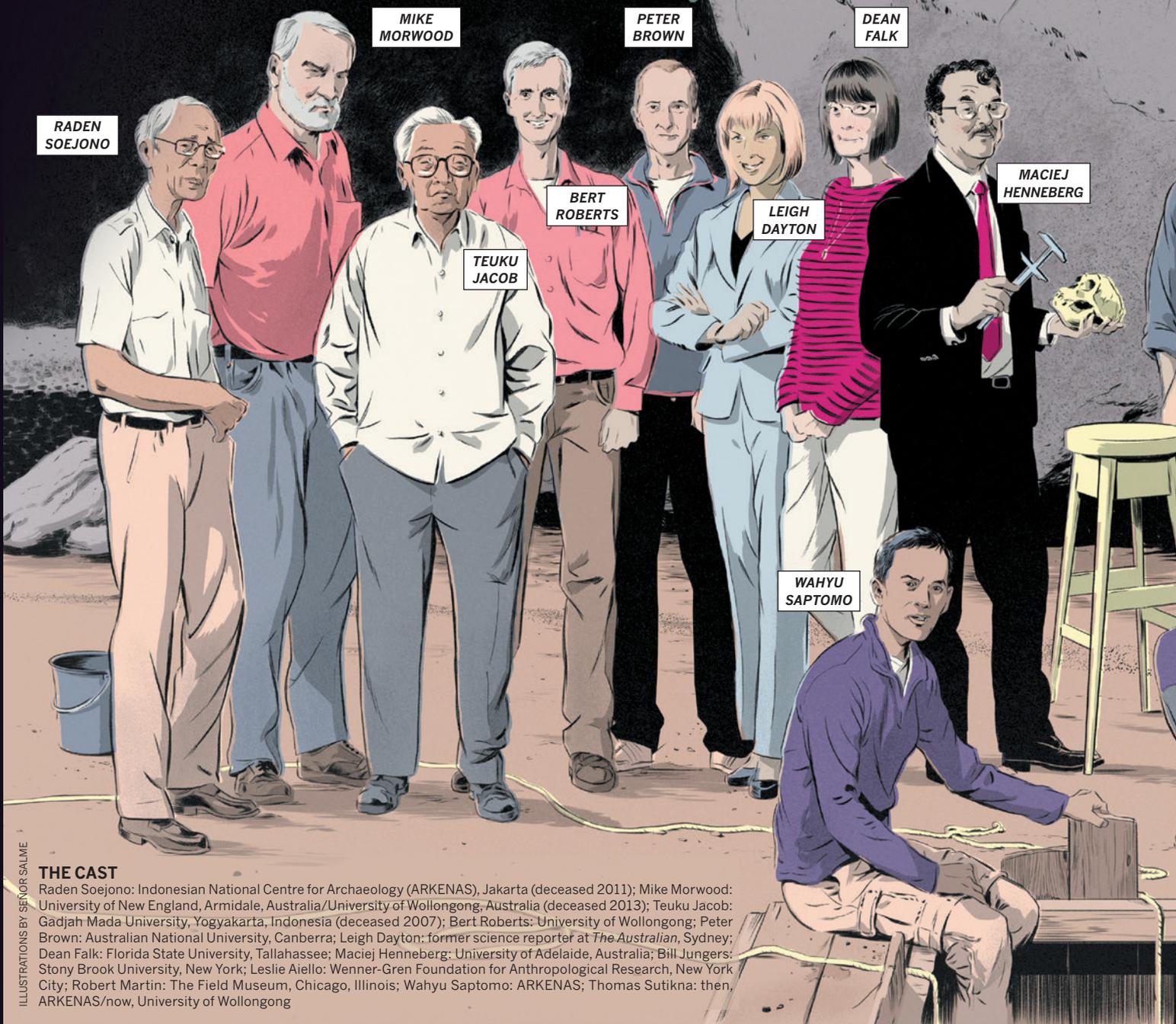


# Tales of the hobbit

In 2004, researchers announced the discovery of *Homo floresiensis*, a small relative of modern humans that lived as recently as 18,000 years ago. The 'hobbit' is now considered the most important hominin fossil in a generation. Here, the scientists behind the find tell its story

BY EWEN CALLAWAY



**RADEN SOEJONO**

**MIKE MORWOOD**

**PETER BROWN**

**DEAN FALK**

**TEUKU JACOB**

**BERT ROBERTS**

**LEIGH DAYTON**

**MACIEJ HENNEBERG**

**WAHYU SAPTOMO**

## THE CAST

Raden Soejono: Indonesian National Centre for Archaeology (ARKENAS), Jakarta (deceased 2011); Mike Morwood: University of New England, Armidale, Australia/University of Wollongong, Australia (deceased 2013); Teuku Jacob: Gadjah Mada University, Yogyakarta, Indonesia (deceased 2007); Bert Roberts: University of Wollongong; Peter Brown: Australian National University, Canberra; Leigh Dayton: former science reporter at *The Australian*, Sydney; Dean Falk: Florida State University, Tallahassee; Maciej Henneberg: University of Adelaide, Australia; Bill Jungers: Stony Brook University, New York; Leslie Aiello: Wenner-Gren Foundation for Anthropological Research, New York City; Robert Martin: The Field Museum, Chicago, Illinois; Wahyu Saptomo: ARKENAS; Thomas Sutikna: then, ARKENAS/now, University of Wollongong



BILL JUNGERS

LESLIE AIELLO

ROBERT MARTIN

THOMAS SUTIKNA

The hobbit team did not set out to find a new species. Instead, the researchers were trying to trace how ancient people travelled from mainland Asia to Australia. At least that was the idea when they began digging in Liang Bua, a large, cool cave in the highlands of Flores in Indonesia. The team was led by archaeologists Mike Morwood and Raden Soejono, who are now deceased.

**THOMAS SUTIKNA (field archaeologist in charge of the excavation):** In 1999, Mike came to our office and proposed excavating at Liang Bua. 'Liang Bua' means cold cave. It's 500 metres above sea level, and it's situated very close to the confluence of two rivers, which provide natural resources like water and raw materials for stone artefacts. The roof is really high, providing good circulation. There's regular sunlight year round. It's very suitable for habitation.

**RICHARD 'BERT' ROBERTS (geochronologist who conceived the dig with Morwood):** The excavations started off on a very small scale in 2001, but we found some interesting things: bones of stegodons, which are these now-extinct primitive elephants. There were lots of Komodo dragons, lots of rat bones, all sorts of other species, including this kind of giant stork. We didn't find anything spectacular until 2003.

**WAHYU SAPTOMO (field archaeologist):** Before Mike Morwood left for the season in 2003, I said, "Why are you leaving now? If you leave, maybe we will find something important." A few days later, on 2 September, I was supervising sector VII. Our local workers were digging at around 5.9 metres. Their trowel met with a skull. A member of our team who specializes in animal and human bones came down and said, "Yes, I'm sure that's a human bone. But it's very small." Thomas, he was sick and was at the hotel that day. So I went back and met with him. I said, "We have something very important. We found the first hominid in the Pleistocene layer."

**SUTIKNA:** Immediately, my fever vanished. I couldn't sleep well that night. I couldn't wait for sunrise. In the early morning we went to the site, and when we arrived in the cave, I didn't say a thing because both my mind and heart couldn't handle this incredible moment. I just went down to the pit and looked at the bones carefully. It would be impossible to get them out because of the condition of the bones. So we decided to cut the remains out, together with the sediment, block by block, and bring them back to the hotel. We needed several days to take out all the bones.

**ROBERTS:** It was a very small body. That was the first thing that was immediately apparent — but also an incredibly small skull. We first thought, "Oh, it's a child." There was a guy who was working with us called Rokus. He did all the faunal identifications of the bones. But Rokus said, "No, no, no, it's not a child. It's not modern human at all. It's a different species."

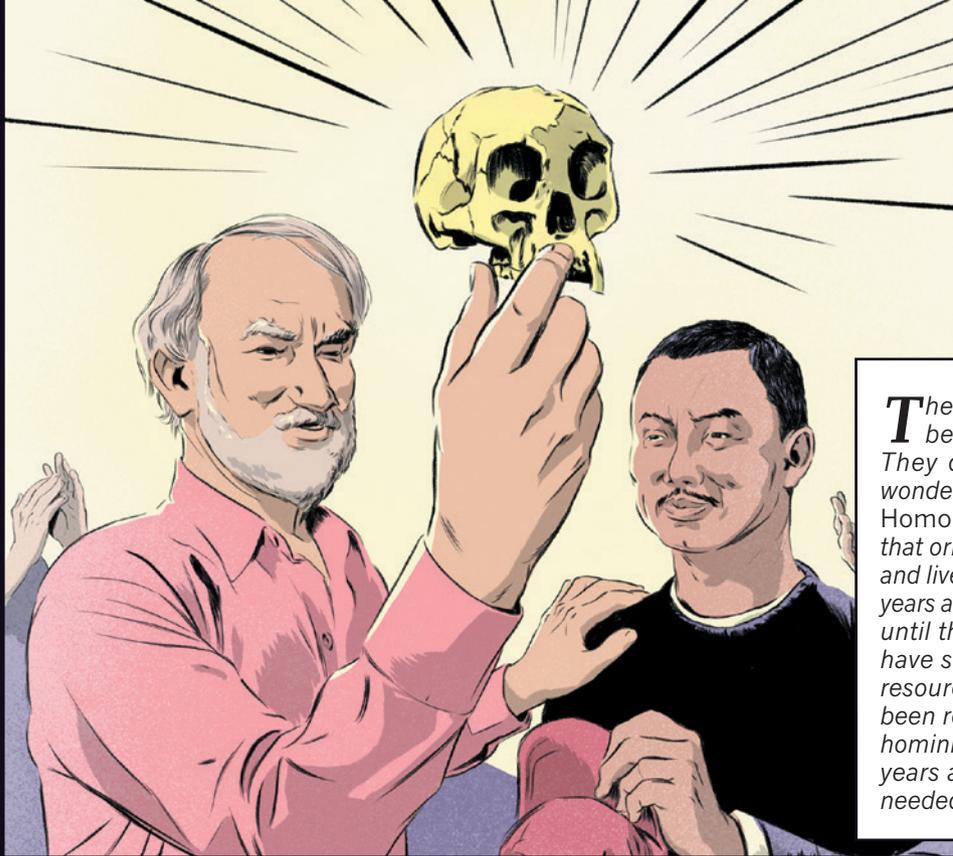
**SAPTOMO:** Thomas drew the skeleton on paper, and he faxed the drawing to Mike and to Professor Soejono in Jakarta.

**SUTIKNA:** Mike called me at night. I couldn't understand what he was saying over the phone, he was so excited.

**ROBERTS:** Mike invited Peter Brown to come and look at the remains. Peter's a very good palaeoanthropologist, but he's kind of a difficult person as well. Peter can be kind of prickly.

**PETER BROWN (palaeoanthropologist):** Mike doesn't know much about human skeletons, and the Indonesian researchers didn't either. I was quite sceptical. The drawing may as well have been a Greek urn in terms of looking like anything much at all.

I was interested and willing to go to Jakarta. It's an interesting place to visit. I like the food. I like the atmosphere and the culture and everything else, but I didn't expect to find anything interesting or important. At the most, I thought it was going to be a sub-adult modern human ▶



primitive-looking human who was living this side of the last glacial maximum, this side of the last Ice Age.

**BROWN:** If Mike had said he'd found evidence of an alien spaceship on Flores, I would have been less surprised.

**T**he team soon determined that the skeleton belonged to a female just over a metre tall. They dubbed her LB1. Brown and Morwood wondered whether the species was an offshoot of *Homo erectus* — an ancient relative of humans that originated in Africa about 2 million years ago and lived on Java, near Flores, until about 150,000 years ago. If its descendents had survived on Flores until the tail end of the last Ice Age, they might have shrunk in response to the island's limited resources. Alternatively, the species might have been related to australopithecines, small-bodied hominins that roamed Africa more than 2 million years ago. Brown and Morwood knew that they needed to let the world in on their find.

► skeleton, probably dating to the Neolithic period or maybe a little bit earlier. The other possibility was a pathological individual, someone with a growth disorder. Those were my expectations when I turned up.

**ROBERTS:** Peter's as sceptical as I was, probably thinking, "A new human species? Sure, probably Mike getting overexcited in Jakarta. He'd been in the bush for too long." Good on him for flying over there straight away, because most people have got teaching commitments and things you've got to be getting on with.

**BROWN:** I walked into the laboratory with Mike and the lower jaw — the mandible — had been cleaned. And it was in about six seconds, maybe less, of looking at the lower jaw, I knew it couldn't have been a modern human lower jaw. I knew it had to be from another species, and things went on from there. I started cleaning the skull and doing other work on the collections. Everything was very, very soft and had to be dried out and coated with preservative. It would have been very easy to scratch or smash. If you'd stepped on it, you would have ended up with a pile of mashed potato, more or less.

**ROBERTS:** Some people, like the guys in Africa, seem to work on things for about 10 or 15 years before you finally get a fossil description. Peter was working at lightning speed by comparison. To Mike and myself it still seemed to take forever.

**BROWN:** I smuggled some mustard seeds through customs for the purpose of measuring the volume of the brain. So I cleaned it all as carefully as I could. I turned it upside down, and I poured the seeds in it. I'd taken enough seeds to measure the size of a modern human brain, say 1.5 litres of seeds, but it only took about 400 millilitres. I was flabbergasted. The last time things with a brain that size walked was around about 2.5 million to 3 million years ago. It was not making any sense at all. I recorded it a second time, a third time. Mike and Thomas are looking at me and wondering why I'm going a bit pale. I was trying to push more seeds into the skull with my finger to try and increase the volume, because it was insane really.

**ROBERTS:** The carbon dates came in and they were around 18,000 years. So at that point it was, "Oh, this is absolutely bizarre." This was a very

**HENRY GEE (senior editor at *Nature*):** I had no warning. Usually with these things you tend to get a little bit of scuttlebutt. But this one just came onto my desk one day in March 2004, and there it was.

**ROBERTS:** Poor old Henry probably fell off his chair when he got the papers.

**GEE:** I have to say at first it didn't strike me as this most fantastic discovery. They had this strange creature and the tone of the paper was very subdued. When you're an editor you read between the lines, and the line was: "Help us. We don't know what this thing is. We're just going to describe it and we're going to give it a very non-committal name and see what you think."

**BROWN:** I thought it was a new species and probably a new genus. I just thought it was so different.

**GEE:** When it came to us, they had given it this Latin name, *Sundanthropus floresianus* — man from the Sunda region from Flores. Well, the referees said it's a member of *Homo* so that's what it should be, and one of the referees says *floresianus* actually means 'flowery anus' so it should be *floresiensis*. So *Homo floresiensis* came along.

**ROBERTS:** We knew we had to come up with a name for publicity purposes. We couldn't call it *Homo floresiensis*, so Mike said, "I like hobbit." I said, "Okay as long as it's not going to cause any problems with Tolkien's estate," or whatever they're called. They can get pretty stropy with people using their trademarked words. Mike referred to LB1 as hobbit, not 'the' hobbit, as if its name was Mary. For a while, Mike was trying to persuade Peter Brown to call it *Homo hobbitus*. I think he just thought Mike was a complete charlatan for even suggesting it.

**BROWN:** Mike and I didn't agree about nicknames because I thought it trivialized it, and I thought it would result in every loon on the planet telephoning me as soon as it was published. And that was true — endless bizarre telephone calls from people who had seen some small hairy person in their backyard.

**MORE ONLINE**

See *Nature's* online special on the hobbit: [go.nature.com/hobbit10](http://go.nature.com/hobbit10)

**W**hen the papers reporting the discovery were published<sup>1,2</sup> on 27 October 2004 (28 October in Australia and Indonesia), they grabbed public attention in a way few science stories manage.

**LEIGH DAYTON (science correspondent):** It was huge, absolutely huge. Everybody was talking about it. Even my editors who absolutely do not like science whatsoever, they were fascinated. I'm just looking at the newspaper, the hard copy of the story I wrote for *The Australian*, and the other stories are all the usual political stuff, police probes, inflation figures, and then, "Small, but they're only human".

**BILL JUNGERS (palaeoanthropologist):** I had to check the date to make sure it wasn't April Fool's Day. It was so preposterous on the surface that there could be this little hominin that evolved in isolation in southeast Asia for God knows how long and persisted until almost the Holocene.

**ROBERTS:** This one really did garner just a massive amount of media interest. Way over the top. Every newspaper wanted to talk to you, TV programmes; everyone wanted to talk to everyone.

**BROWN:** The press being the way they are, they always like controversy. It's no good just to have a good story. Nobody wants to read that, so they're always trying to find someone who disagrees.

**MACIEJ HENNEBERG (palaeoanthropologist):** I had a phone call at 7 a.m. on 28 October 2004, from an Australian Broadcasting Corporation (ABC) journalist, who asked me, "What do you think about the new find?" I said, "I don't think anything, you just woke me up." He said it was published in *Nature* that there is this new species. I said, "Okay. Give me a few hours so I can find the papers." While I was reading, I was reminded of a paper on a microcephalic [small-brained] skull from Crete, about 4,000 years old. All the measurements of the LB1 skull were not significantly different from this clearly pathological skull from Crete. So at 11 a.m., I went on ABC radio and I said I think that what was found was a pathological specimen. This kind of explanation attracted a lot of attention.

**F**urther controversy erupted when Teuku Jacob, head of Indonesia's national palaeoanthropology institute, decided that the hobbit's bones belonged in his lab.

**ROBERTS:** Soejono invited Teuku Jacob to come over and have a look at the bones, and then Jacob just put them in a suitcase and walked out the door with them. Mike was absolutely ballistic. I didn't think we'd ever actually get to see the bones back again.

**BROWN:** The real disreputable thing was they tried to take moulds and cast this material. I hadn't done that because it was clear the material was too soft and too fragile to take moulds. When they had done that, the lower jaw was broken, the skull was damaged.

**T**he bones made it back to Jakarta, but the debate over the hobbit's identity grew hotter. Morwood brought in specialists to examine the fossil, and they agreed with him that it was a new species. Some key studies focused on endocasts — moulds of the inside of the hobbit's skull that revealed details of its brain.

**JUNGERS:** Mike didn't have to ask twice. I was introduced to the team in person in Jakarta in 2006, and a good part of my career has been obsessing about this fossil ever since.

**ROBERTS:** Quite a few on the American side started to throw their weight behind our team, and that helped steady the ship. They really took the hobbit to pieces and put it back together again, and found it was really a very unusual kind of animal.

**JUNGERS:** I was able to assemble a nearly complete foot that was unlike anything I've ever seen in the fossil record. I think these little guys were climbers. I don't know if you've ever been to Flores, but there were these huge Komodo dragons on the island when those guys were around. The adults don't climb, so if I were a hobbit, I would find refuge in the trees.

**DEAN FALK (evolutionary anthropologist):** Mike Morwood invited me to prepare and describe the endocast. I had a bias going into the study. I thought, because the brain was so small, that it was going to look like other primates with brains of that size, namely apes, and it didn't. It didn't look like a chimp brain. What it mostly looked like in overall shape was the endocast from *Homo erectus*.

**O**ther scientists have continued to support the idea that the LB1 specimen was a diseased human.

**ROBERT MARTIN (biological anthropologist):** I think there is something seriously weird about the LB1 specimen. The best I could come up with is microcephaly. There are hundreds of genes that can produce a small brain, with knock-on effects throughout the body.

**FALK:** We felt like, okay, we need to do a microcephalic study. I ended up running with that ball and got together a very small sample, about ten, but it's really hard to find ten endocasts from microcephalics. ▶



► We looked at LB1 and we showed there was no way it was a microcephalic. As far as I'm concerned, that paper<sup>3</sup> answered it, and I think that persuaded most everybody, except a few people. I think they even were persuaded eventually, because they changed diseases. The 'sick-hobbit hypothesis', Bill Jungers called it.

**JUNGERS:** It seems like we've got a new one every day. It's just crazy, crazy stuff. We spent a lot of time unfortunately having to deal with things like Laron syndrome and cretinism and other wild and woolly hypotheses.

**HENNEBERG:** About two and a half years ago, it all clicked. I could see that all signs of the bones were compatible with Down's syndrome. There are about 20 or so characteristics that are matching. There is not a single characteristic of LB1 that doesn't match.

**MARTIN:** I don't think we've made much progress in ten years, quite honestly. What we have is entrenched positions. We should be talking about the interpretations and the facts, not casting aspersions. I'm not an idiot because I'm questioning this.

**LESLIE AIELLO (palaeoanthropologist):** There were some important issues raised during the controversy that the proponents of a new-species hypothesis had to address. But the criticism of the hypothesis didn't turn out to hold any water.

**FALK:** In palaeoanthropology there's always controversy over new specimens. Always has been, always will be. I was a little surprised that in this day and age it would be so over the top.

**AIELLO:** There were personalities involved. The field is full of a lot of egos, and particularly male egos.

**ROBERTS:** I think the view now is: yup, it's not a diseased modern human. But whether it's a shrunken down version of a *Homo erectus*, or whether it's something more ancient like a *Homo habilis*, or even an australopithecine who's managed to struggle out of Africa — that's still pretty much up for grabs.

**BROWN:** I'm mostly interested in how it got to be where it was, which will require the discovery of additional material. That may not happen in my lifetime.

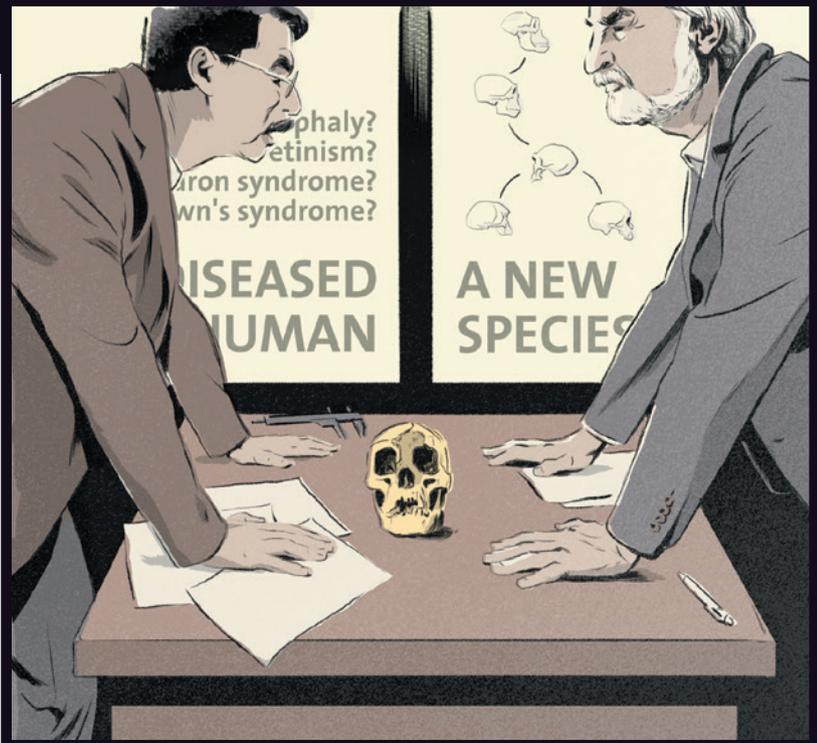
**AIELLO:** It'll happen. I tell my students that something is found every year and I never gave the same lectures twice.

**ROBERTS:** That's why we're still trying to dig up in the centre of the island, looking in the Soa Basin on Flores. Mike took another view: let's try and find the bones of the ancestors, wherever they came from, which was probably north of Flores. So Mike and I went to the Philippines, and we also went to Sulawesi, Indonesia. Mike was still doing excavations on Sulawesi, as are several of the people here.

**JUNGERS:** I never met anybody who was as single-minded and sustained in their work as Mike. He was always looking over the horizon to the next excavation, the next expedition. I excavated at Liang Bua off and on, and the last time I saw Mike was that summer before he passed.

**ROBERTS:** Mike actually came and saw me and said, "Ah Bert, I need to talk to you about something." He said "I've got cancer." He seemed to be getting tired more and more easily, and that wasn't like Mike at all.

**JUNGERS:** Mike died of complications of prostate cancer, and he was so consumed by his work that I think he neglected his health. It didn't occur to him that he should take better care of himself. Even when he was diagnosed, the only thing he wanted to talk about was the next expedition.



He was an original and became a good friend, and I miss him.

**ROBERTS:** Who would have thought ten years ago that Mike wouldn't have been with us now? He was one of the forces of nature. Without Mike, it wouldn't have happened.

**The hobbit team is still digging up Liang Bua. With new dating work, the researchers hope to determine when *H. floresiensis* went extinct and whether it overlapped with modern humans in the region. The hobbit's discovery thrust southeast Asia to the forefront of research into human evolution, suggesting that key events might have happened there. But the find also complicated the history of *Homo* species in Asia.**

**ROBERTS:** We had such a nice simple story, where we had modern humans and Neanderthals, and we bumped them off, that was the end of Neanderthals. We ventured across southeast Asia and it was basically empty because *Homo erectus* had died out there already, and we sort of just wandered into Australia and there we go. It was a clean and almost crisp little story. It made nice sense. Everyone was happy with that. And then suddenly the hobbit pops its head up.

**BROWN:** Now I'm more open to the idea that very small-bodied and small-brained bipeds moved out of Africa at a much earlier date, maybe 3 million years ago, or earlier. I'm more open to the idea that there were lots of failures in the evolution of bipeds. Some were successful, some weren't. It's a very branchy tree, and it just so happens we've survived.

**ROBERTS:** To me, the ultimate value of the hobbit is not what it is, in and of itself, because it's just a dead end. It probably didn't lead to anything that's alive today. But it opened up the door for people to think more broadly about everything. I think the hobbit changed the way people thought. ■ SEE COMMENT P.427

**Ewen Callaway writes for Nature from London.**

1. Brown, P. et al. *Nature* **431**, 1055–1061 (2004).
2. Morwood, M. J. et al. *Nature* **431**, 1087–1091 (2004).
3. Falk, D. et al. *Proc. Natl Acad. Sci. USA* **104**, 2513–2518 (2007).