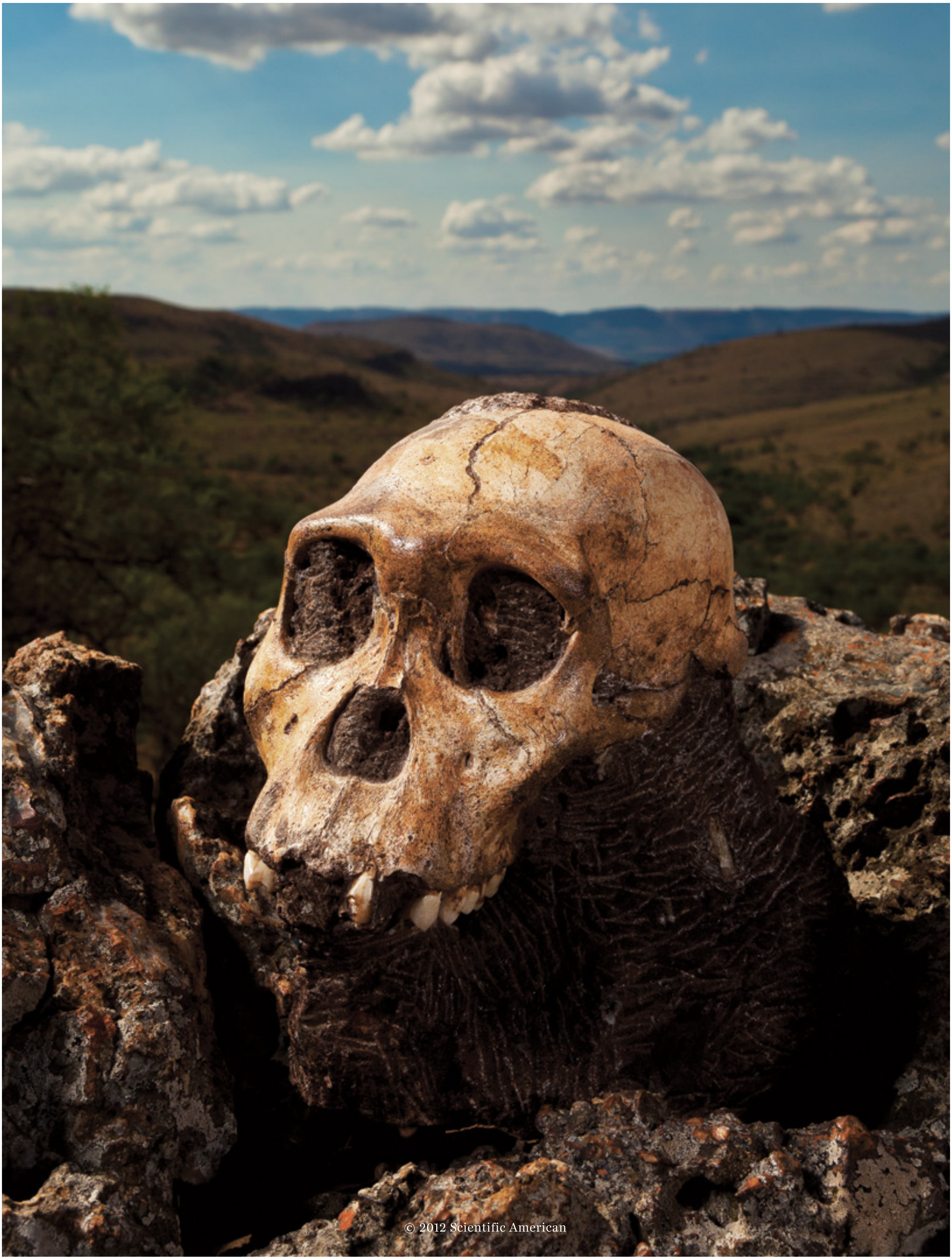

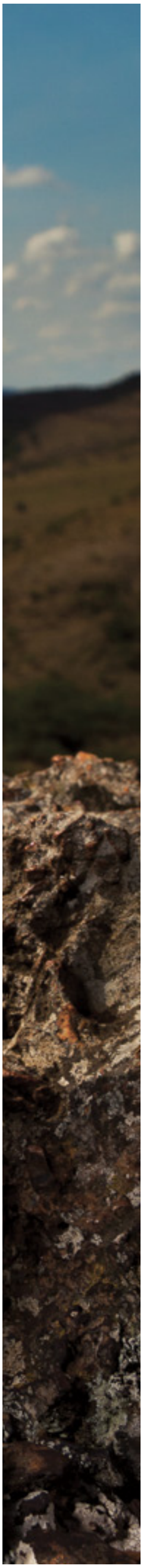

BRENT STIRTON *Getty Images*

HUMAN EVOLUTION

# First of Our Kind

## Sensational fossils from South Africa spark debate over how we came to be human

*By Kate Wong*

IN BRIEF

**The origin of our genus,** *Homo,* is one of the biggest mysteries facing scholars of human evolution.

**Based on the meager evidence** available, scientists have surmised that *Homo* arose in East Africa, with Lucy's species, *Australopithecus afarensis,* giving rise to the founding member of our lineage, *Homo habilis.*

**Recently discovered fossils** from a site northwest of Johannesburg, South Africa, could upend that scenario. The fossils represent a previously unknown species of human with an amalgam of australopithecine and *Homo* traits that suggest to its discoverers that it could be the ancestor of *Homo.*

**NEW HUMAN SPECIES from South Africa—*Australopithecus sediba*—has been held up as the ancestor of our genus, *Homo.***

SOMETIME BETWEEN THREE MILLION AND TWO million years ago, perhaps on a primeval savanna in Africa, our ancestors became recognizably human. For more than a million years their australopithecine predecessors—Lucy and her kind, who walked upright like us yet still possessed the stubby legs, tree-climbing hands and small brains of their ape forebears—had thrived in and around the continent's forests and woodlands. But their world was changing. Shifting climate favored the spread of open grasslands, and the early australopithecines gave rise to new lineages. One of these offshoots evolved long legs, toolmaking hands and an enormous brain. This was our genus, *Homo,* the primate that would rule the planet.

For decades paleoanthropologists have combed remote corners of Africa on hand and knee for fossils of *Homo*'s earliest representatives, seeking to understand the details of how our genus rose to prominence. Their efforts have brought only modest gains—a jawbone here, a handful of teeth there. Most of the recovered fossils instead belong to either ancestral australopithecines or later members of *Homo*—creatures too advanced to illuminate the order in which our distinctive traits arose or the selective pressures that fostered their emergence. Specimens older than two million years with multiple skeletal elements preserved that could reveal how the *Homo* body plan came together eluded discovery. Scientists' best guess is that the transition occurred in East Africa, where the oldest fossils attributed to *Homo* have turned up, and that *Homo*'s hallmark characteristics allowed it to incorporate more meat into its diet—a rich source of calories in an environment where fruits and nuts had become scarce. But with so little evidence to go on, the origin of our genus has remained as mysterious as ever.

Lee Berger thinks he has found a big piece of the puzzle. A paleoanthropologist at the University of the Witwatersrand in Johannesburg, South Africa, he recently discovered a trove of fossils that he and his team believe could revolutionize researchers' understanding of *Homo*'s roots. In the white-walled confines of room 210 at the university's Institute for Human Evolution, he watches as Bernard Wood of George Washington University paces in front of the four plastic cases that have been removed from their fireproof safe and placed on a table clothed in royal blue velvet. The foam-lined cases are open, revealing the nearly two-million-year-old fossils inside. One holds pelvis and leg bones. Another contains ribs and vertebrae. A third displays arm bones and a clavicle. And a fourth houses a skull. On a counter opposite the table, more cases hold a second partial skeleton, including a nearly complete hand.

Wood, a highly influential figure in the field, pauses in front of the skull and leans in for a closer look. He strokes his beard as he considers the dainty teeth, the grapefruit-size braincase. Straightening back up, he shakes his head. "I'm not often at a loss for words," he says slowly, almost as if to himself, "but wow. Just wow."

Berger grins. He has seen this reaction before. Since he unveiled the finds in 2010, scientists from all over the world have been flocking to his lab to gawk at the breathtaking fossils. Based on the unique anatomical package the skeletons present, Berger and his team assigned the remains to a new species, *Australopithecus sediba*. They furthermore propose that the combination of primitive *Australopithecus* traits and advanced *Homo* traits evident in the bones qualifies the species for a privileged place on the family tree: as the ancestor of *Homo*. The stakes are high. If Berger is right, paleoanthropologists will have to completely rethink where, when and how *Homo* got its start—and what it means to be human in the first place.

### THE ROAD NOT TAKEN

IN THE MIDDLE of the rock-strewn dirt road that winds through the John Nash Nature Reserve, Berger brings the Jeep to a halt and points to a smaller road that branches right. For 17 years he had made the 40-kilometer trip northwest from Johannesburg to the 9,000-hectare parcel of privately owned wilderness and driven past this turnoff, continuing along the main road, past the resident giraffes and warthogs and wildebeests, to a cave he was excavating just a few kilometers away called Gladysvale. In 1948 American paleontologists Frank Peabody and Charles Camp came to this area to look for fossils of hominins (modern humans and their extinct relatives) on the advice of famed South African paleontologist Robert Broom, who had found such fossils in the caves of Sterkfontein and Swartkrans, eight kilometers away. Peabody suspected that Broom had intentionally sent them on a wild goose chase, so unimpressed was he with the sites here. Little did Berger or the expeditioners before him know that had they only followed this smaller path—one of

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**LEE BERGER** (*left*) and Meshack Kgasi (*right*) inspect the miners' pit at the Malapa site, where Berger discovered *Australopithecus sediba* (*1*). Blocks of concretelike calcified clastic sediment dislodged by miners will be CT-scanned to see if they contain fossils (*2*). View captures the valleys in and around the Malapa area, northwest of Johannesburg in South Africa (*3*).

BRENT STIRTON *Getty Images*

several miners' tracks used in the early 1900s to cart the limestone that built Johannesburg from quarries out to the main road—they would have made the discovery of a lifetime.

Berger, now 46 years old, never imagined he would find something like *A. sediba*. Although he thought *Homo* might have had roots in South Africa instead of East Africa, he knew the odds of making a big find were slim. Hominin fossils are extremely rare, so "you don't have any expectations," he reflects. What is more, he was focused on the so-called Cradle of Humankind, an already intensively explored region whose caves had long been yielding australopithecines generally considered to be more distantly related to *Homo* than the East African australopithecines seemed to be. And so Berger continued to toil at Gladysvale day after day, year after year. Because he found little in the way of hominins among the millions of animal fossils there—just scraps of a species called *A. africanus*—he busied himself with another goal: dating the site. A critical problem with interpreting the South African hominin fossils was that scientists had not yet figured out how to reliably determine how old they were. In East Africa, hominin fossils come from sediments sandwiched between layers of volcanic ash that blanketed the landscape during long-ago eruptions. Geologists can ascertain how old an ash layer is by analyzing its chemical "fingerprint." A fossil that originates from a layer of sediment that sits in between two volcanic ashes is thus intermediate in age between those two ashes. The cave sites in the Cradle of Humankind lack volcanic ashes. Through his 17 years of trial and error at Gladysvale, however, Berger and his colleagues hit on techniques that circumvented the problem of not having ash to work with.

Those techniques would soon come in very handy. On August 1, 2008, while surveying the reserve for potential new fossil sites in the area that he had identified using Google Earth, Berger turned right on the miners' track he had passed by for 17 years and followed it to a three- by four-meter hole in the ground blasted by the miners. Eyeballing the site, he found a handful of animal fossils—enough to warrant a trip back for a closer look. He returned on August 15 with his then nine-year-old son, Matthew, and dog, Tau. Matthew took off into the bush after Tau, and within minutes he shouted to his father that he had found a fossil. Berger doubted it was anything important—probably just an antelope bone—but in a show of fatherly support, he made his way over to inspect the find. There, protruding from a dark hunk of rock nestled in the tall grass by the corpse of a lightning-struck tree, was the tip of a collarbone.

As soon as Berger laid eyes on it, he knew it belonged to a hominin. In the months that followed he found more of the clavicle's owner, along with another partial skeleton, 20 meters away in the miners' pit. To date, Berger and his team have recovered more than 220 bones of *A. sediba* from the site—more than all the known early *Homo* bones combined. He christened the site *Malapa,* meaning "homestead" in the local Sesotho language. Using the approaches honed at Gladysvale, the geologists on Berger's team would later date the remains with remarkable precision to 1.977 million years ago, give or take 2,000 years.

## A PATCHWORK PREDECESSOR

THAT THE MALAPA FOSSILS include so many body parts is important because it means they can offer unique insights into the order in which key *Homo* traits appeared. And what they show very clearly is that quintessentially human features did not necessarily evolve as a package deal, as was thought. Take the pelvis and the brain, for example. Conventional wisdom holds that the broad, flat pelvis of australopithecines evolved into the bowl-shaped pelvis seen in the bigger-brained *Homo* to allow delivery of babies with larger heads. Yet *A. sediba* has a *Homo*-like pelvis with a broad birth canal in conjunction with a teeny brain—just 420 cubic centimeters, a third of the size of our own brain. This combination shows brain expansion was not driving the metamorphosis of the pelvis in *A. sediba*'s lineage.

Not only do the *A. sediba* fossils mingle old and new versions of general features, such as brain size and pelvis shape, but the pattern repeats at deeper levels, like an evolutionary fractal. Analysis of the interior of the young male's braincase shows that the brain, while small, possessed an expanded frontal region, indicating an advanced reorganization of gray matter; the adult female's upper limb pairs a long arm—a primitive holdover from a tree-dwelling ancestor—with short, straight fingers adapted to making and using tools (although the muscle markings on the bones attest to powerful, apelike grasping capabilities). In some instances, the juxtaposition of old and new is so improbable that had the bones not been found joined together, researchers would have interpreted them as belonging to entirely different creatures. The foot, for instance, combines a heel bone like an ancient ape's with an anklebone like *Homo*'s, according to Malapa team member Bernard Zipfel of the University of the Witwatersrand. It is as if evolution was playing Mr. Potato Head, as Berger puts it.

The extreme mosaicism evident in *A. sediba,* Berger says, should be a lesson to paleoanthropologists. Had he found any number of its bones in isolation, he would have classified them differently. Based on the pelvis, he could have called it *H. erectus.* The arm alone suggests an ape. The anklebone is a match for a modern human's. And like the blind men studying the individual parts of the elephant, he would have been wrong. "*Sediba* shows that one can no longer assign isolated bones to a genus," Berger asserts. That means, in his view, finds such as a 2.3-million-year-old upper jaw from Hadar, Ethiopia, that has been held up as the earliest trace of *Homo* cannot safely be assumed to have belonged to the *Homo* line.

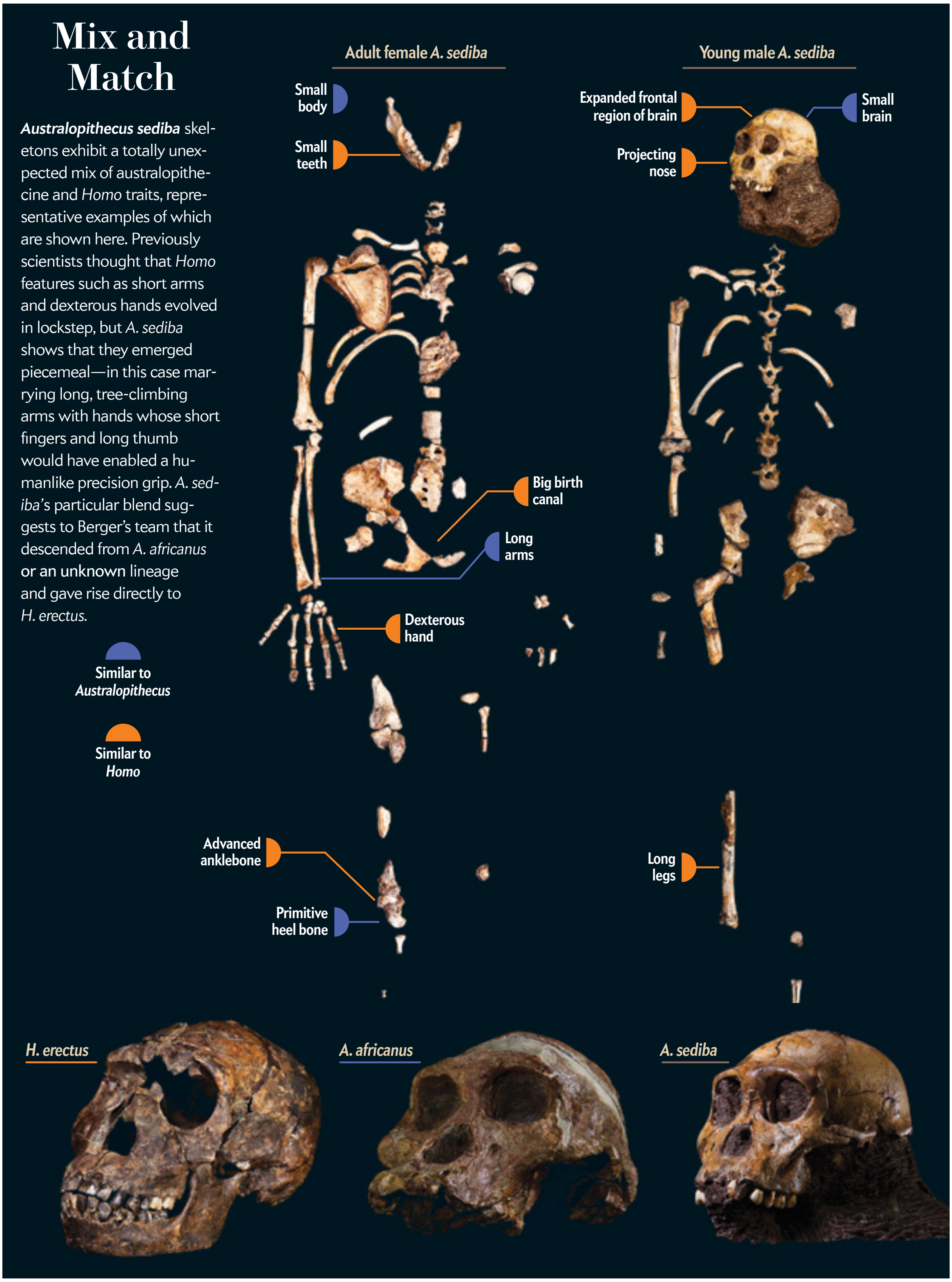
Taking that jaw out of the running would make *A. sediba* older than any of the well-dated *Homo* fossils but still younger than *A. afarensis,* putting it in pole position for the immediate ancestor of the genus, Berger's team contends. Furthermore, considering *A. sediba*'s advanced features, the researchers propose that it could be specifically ancestral to *H. erectus* (a portion of which is considered by some to be a different species called *H. ergaster*). Thus, instead of the traditional view in which *A. afarensis* begat *H. habilis,* which begat *H. erectus,* he submits that *A. africanus* is the likely ancestor of *A. sediba,* which then spawned *H. erectus.*

If so, that arrangement would relegate *H. habilis* to a dead-end side branch of the human family tree. It might even kick *A. afarensis*—long considered the ancestor of all later hominins, including *A. africanus* and *Homo*—to the evolutionary curb, too. Berger points out that *A. sediba*'s heel is more primitive than that of *A. afarensis,* indicating that *A. sediba* either underwent an evolutionary reversal toward a more primitive heel or that it descended from a different lineage than the one that includes *A. afarensis* and *A. africanus*—one that has yet to be discovered.

"In the South, we have a saying: 'You dance with the girl you

# Mix and Match

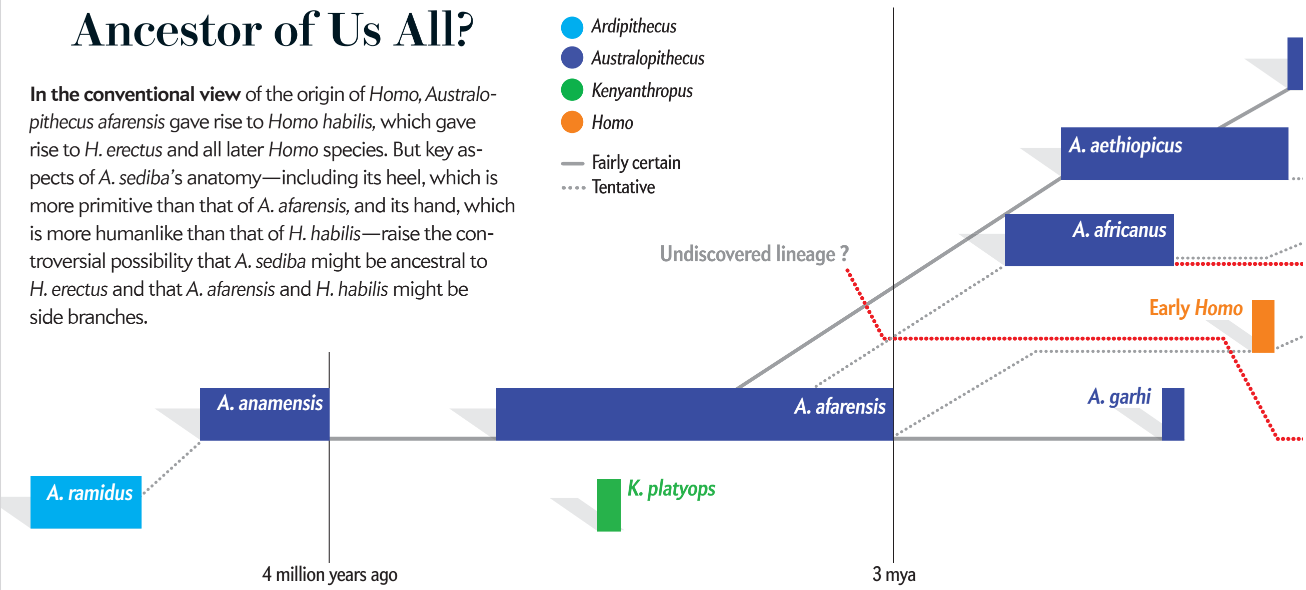
***Australopithecus sediba*** skeletons exhibit a totally unexpected mix of australopithecine and *Homo* traits, representative examples of which are shown here. Previously scientists thought that *Homo* features such as short arms and dexterous hands evolved in lockstep, but *A. sediba* shows that they emerged piecemeal—in this case marrying long, tree-climbing arms with hands whose short fingers and long thumb would have enabled a humanlike precision grip. *A. sediba*'s particular blend suggests to Berger's team that it descended from *A. africanus* or an unknown lineage and gave rise directly to *H. erectus*.




BRENT STIRTON *Getty Images*

## Ancestor of Us All?

**In the conventional view** of the origin of *Homo, Australopithecus afarensis* gave rise to *Homo habilis,* which gave rise to *H. erectus* and all later *Homo* species. But key aspects of *A. sediba*'s anatomy—including its heel, which is more primitive than that of *A. afarensis,* and its hand, which is more humanlike than that of *H. habilis*—raise the controversial possibility that *A. sediba* might be ancestral to *H. erectus* and that *A. afarensis* and *H. habilis* might be side branches.




brought,'" quips Berger, who grew up on a farm in Sylvania, Ga. "And that is what paleoanthropologists have been doing" in trying to piece together the origin of *Homo* from the fossils that have turned up in East Africa. "Now we have to recognize there is more potential out there," he states. Maybe the East Side story of human origins is wrong. The traditional view of South Africa's oldest hominin fossils is that they represent a separate evolutionary experiment that ultimately fizzled out. *A. sediba* could turn the tables and reveal, in South Africa, another lineage, the one that ultimately gave rise to humankind as we know it (indeed, *sediba* is the Sesotho word for "fountain" or "wellspring").

William Kimbel of Arizona State University, who led the team that found the 2.3-million-year-old jawbone in Ethiopia, is having none of it. The idea that one needs a skeleton to classify a specimen is a "nonsensical argument," he retorts. The key is to find pieces of anatomy that contain diagnostic traits, he says, and the Hadar jaw has features clearly linking it to *Homo,* such as the parabolic shape formed by its tooth rows. Kimbel, who has seen the Malapa fossils but not studied them in depth, finds their *Homo*-like traits intriguing, although he is not sure what to make of them. He scoffs at the suggestion that they are directly ancestral to *H. erectus,* however. "I don't see how a taxon with a few characteristics that look like *Homo* in South Africa can be the ancestor [of *Homo*] when there's something in East Africa that is clearly *Homo* 300,000 years earlier," he declares, referring to the jaw.

Kimbel is not alone in rejecting the argument for *A. sediba* as the rootstock of *Homo*. "There are too many things that do not fit, particularly the dates and geography," comments Meave Leakey of the Turkana Basin Institute in Kenya, whose own research has focused on fossils from East Africa. "It is much more likely that the South African hominins are a separate radiation that took place in the south of the continent."

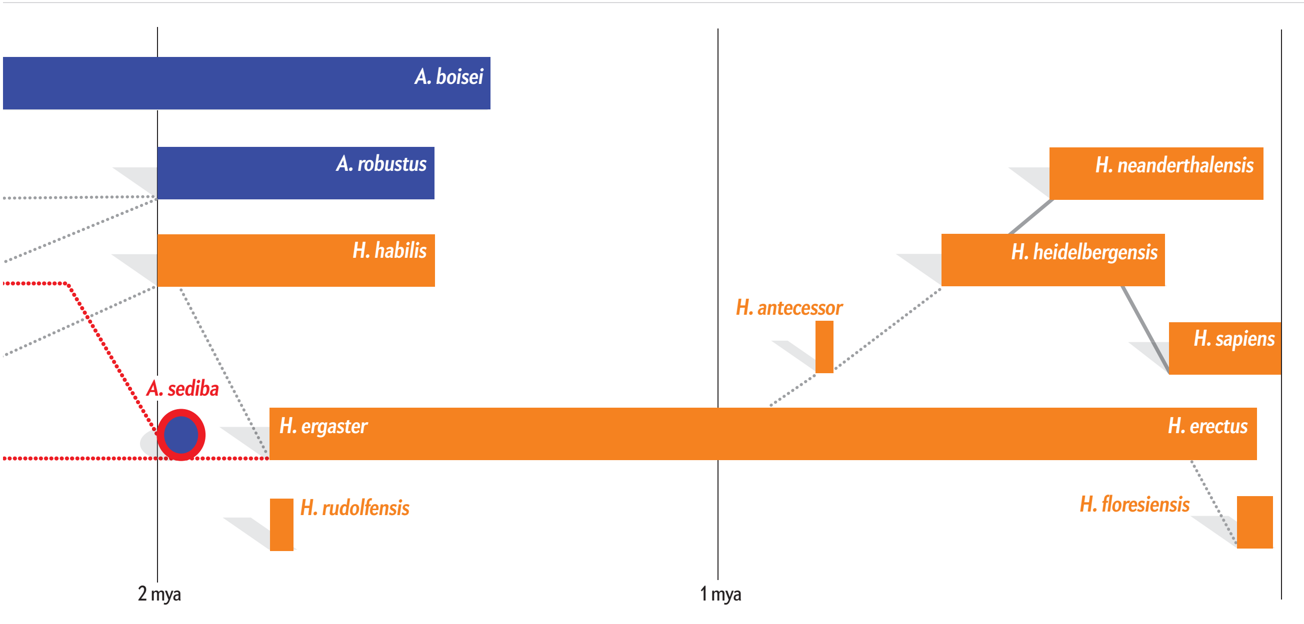
René Bobe of George Washington University says that if the *A. sediba* remains were older—say, around 2.5 million years old—they might make for a plausible *Homo* ancestor. But at 1.977 million years old, they are just too primitive in their overall form to be ancestral to fossils from Kenya's Lake Turkana region that are just a tad younger yet have many more indisputable *Homo* traits. Berger counters that *A. sediba* almost certainly existed as a species before the Malapa individuals. Bobe and others maintain that such information is not currently known. "Paleoanthropologists tend to think of the fossils they find as being in a key position within the [hominin] phylogenetic tree, and in many cases that's unlikely to be the situation," Bobe observes. From a statistical standpoint, "if you have [hominin] populations distributed across Africa, evolving in complex ways, why would the one you find be the ancestor?"

Berger has found a sympathetic ear in Wood, who says Berger is "absolutely right" that *A. sediba* demonstrates that isolated bones do not predict what the rest of the animal looks like. *A. sediba* shows that the combinations of traits evident from previous fossil discoveries do not exhaust the possibilities, Wood remarks. But he does not endorse the suggestion that *A. sediba* is the ancestor of *Homo*. "There are not many characters linking it to *Homo,*" he notes, and *A. sediba* may have evolved those traits independently from the *Homo* lineage. "I just think *sediba* has got too much to do in order to evolve into [*erectus*]," Wood says.

Resolution of the issue of where *A. sediba* belongs in our family tree is hampered by the lack of a clear definition of the genus *Homo*. Coming up with one, however, is a taller order than it might seem. With so few specimens from the transition period, and most of them being scraps, identifying those features that first distinguished *Homo* from its australopithecine forebears—those traits that made us truly human—has proved challenging. The skeletons from Malapa expose just how vexing the situation is: they are so much more complete than any early *Homo* specimen that it is very difficult to compare them with anything. "*Sediba* may force us to come up with a definition," Berger says.



*Graphic by Jen Christiansen*




### ALL IN THE DETAILS

WHATEVER THE POSITION of the Malapa fossils in the family tree, they are poised to provide researchers with the most detailed portrait yet of an early hominin species, in part because they make up multiple individuals. In addition to the juvenile male and the adult female, the two most complete specimens, Berger's team has collected bones representing another four individuals, including a baby. Populations are incredibly rare in the human fossil record, and the individuals at Malapa have the added benefit of peerless preservation. Hominin bones that virtually never survive the ravages of deep time have turned up here: a paper-thin shoulder blade, the delicate sliver that is the first rib, pea-size finger bones, vertebrae with spiny projections intact. And a number of bones that were previously known only from fragments are complete. Before the discovery of Malapa, paleoanthropologists did not have a single complete arm from an early hominin, meaning that the limb lengths that are used to reconstruct such essential behaviors as locomotion are estimates. Even Lucy—the most complete hominin of such antiquity back when she was found in 1974—is missing significant chunks of her arm and leg bones. In the adult female from Malapa, in contrast, virtually the entire upper limb is preserved—from shoulder blade to hand. Only the very last digits of some of her fingers and some wristbones are missing, and Berger expects to find those—and the rest of the bones of both skeletons when he excavates the site (thus far the team has only collected bones visible from the surface, rather than systematically digging for buried material). From this evidence, researchers will be able to reconstruct how *A. sediba* matured, how it moved around the landscape and how members of the population varied from one another, among other things.

It is not only the bones that promise to tell new tales. Malapa has also yielded some other materials that could literally flesh out researchers' understanding of *A. sediba*. Paleontologists have long thought that during the fossilization process, all of an organism's organic components—such as skin, hair, organs, and so forth—are lost to decomposition, leaving behind only mineralized bone. But when Berger saw a CT scan of the skull of the young male, he noticed a place on the crown where there appeared to be an air space between the surface of the fossil and the contour of the actual bone. Examining the spot more closely, he observed a distinctive pattern on the surface that looked like the structural components of skin. He is now conducting extensive tests to determine whether the odd-looking patch on the male's crown and another on the female's chin—and similar patches on antelope bones from the site—are in fact skin.

Preserved skin, if confirmed as such, could reveal *A. sediba*'s coloring and the density and patterning of its hair. Such evidence could also show the distribution of sweat glands—information that would provide insights into how well the species was able to regulate its body temperature, which in turn would have affected how active it was. Sweat glands could additionally offer clues to brain evolution: an effective means of keeping cool was a prerequisite for the emergence of large brain size—a trademark characteristic of *Homo*—because brains are temperature-sensitive. And if organic material is present, Berger might even be able to obtain DNA from the remains. Currently the oldest hominin DNA to have been sequenced is 100,000-year-old DNA from a Neandertal. But because the preservation conditions at Malapa were apparently exceptional, Berger has some hope of getting genetic information from the much older *A. sediba* specimens. In that event, scientists might be able to determine whether the adult female and young male really were mother and son, as has been suggested, and how, if at all, the other hominins at the site fit in. Moreover, such a discovery would prompt researchers at other early hominin sites to test for DNA, which, if successful, could settle debates over how the various hominin species were related.

**SYNCHROTRON X-RAY SCANNING of the skull of the young male *A. sediba* enabled detailed reconstruction of the brain (*pink*), which exhibits advanced reorganization in the frontal lobes despite being little larger than a chimpanzee's brain.**

Preservation of organic remains would be a first in hominin paleontology, and the Malapa team knows it will need extraordinary evidence to persuade the research community of such a claim. Thus far, however, the test results support the hypothesis, and Berger thinks the odds are very good that future analyses will bear it out. After all, similar claims have been made for organic material from dinosaur bones, and those are tens of millions of years older than the Malapa fossils. Organic preservation in hominin assemblages might even be fairly common, he suggests—it is just that no one ever thought to look for it.

Another thing no one thought to look for in a hominin this old? Tartar. The surfaces of the young male's molar teeth bear dark brown stains. Fossil preparators typically clean off the teeth when readying hominin remains for study. But it occurred to Berger that the stains might actually be the same gunk we modern humans fend off with toothbrushes and pilgrimages to the dentist. Ancient tartar would provide valuable insights into the evolution of the hominin diet.

Previous studies of what early humans ate have looked at carbon isotope ratios in teeth, which can indicate whether an animal dined on so-called C3 plants, such as trees and shrubs, or C4 plants, such as certain grasses and sedges—or, in the case of carnivorous species, preyed on animals that ate those plant foods—or some combination thereof over its lifetime. Such evidence is indirect and nonspecific. Tartar, in contrast, is the remnants of the food itself. The team is currently studying tiny

COURTESY OF PAUL TAFFOREAU ESRF

silica crystals called phytoliths that are embedded in the tartar. Phytoliths come from plants, and some plants make species-specific forms of the crystals. Studies of these phytoliths can thus reveal exactly which kinds of plants an animal ate just before it died. By analyzing the isotope ratios, phytoliths and wear marks on *A. sediba*'s teeth that can signal whether an animal was chewing harder or softer foods in the weeks before it perished, the team should be able to glean a wealth of subsistence data. And because the researchers have bones from *A. sediba* individuals across a range of developmental stages, they might even be able to figure out what babies ate versus adult fare, for instance.

In a review paper published in *Science* last October, Peter S. Ungar of the University of Arkansas and Matt Sponheimer of the University of Colorado at Boulder observed that recent analyses have hinted at unexpected diversity and complexity in the diets of our predecessors. Whereas *Ardipithecus ramidus,* one of the earliest putative hominins, dined primarily on C3 foods, as savanna chimpanzees do, other early African hominins appear to have eaten a mix of C3 and C4 foods. One species, *Paranthropus robustus,* even ate a mostly C4 diet, as Thure Cerling of the University of Utah and his colleagues reported last June in the *Proceedings of the National Academy of Sciences USA*. Scientists will no doubt be eager to see where on the dietary spectrum *A. sediba* falls and how that picture fits with emerging clues about the paleoenvironment at Malapa, which appears to have included an abundance of grasses and trees. Perhaps the dietary evidence will shine a light on how *A. sediba* was using that dexterous hand, with its apparent adaptations to tool use—and, by the same token, whether it used its long, apelike arms to forage in the trees.

### END OF DAYS

THE FINAL DAYS of the Malapa hominins appear to have been grim ones. Possible drought conditions may have made water hard to come by. Berger suspects that the hominins, desperate for a drink, may have tried to climb down into the then 30- to 50-meter-deep underground cavern at Malapa to access a shallow pool of freshwater and, in so doing, tumbled to their deaths. Perhaps the boy fell in first, and the adult female—maybe his mother—tried to rescue him only to fall in herself. A menagerie of other beasts, from antelopes to zebras, met the same fate, becoming entombed alongside the hominins for posterity.

Intriguingly, geologic evidence from the site indicates that the fossil assemblage at Malapa formed right around the same time that the earth was undergoing a geomagnetic reversal—a mysterious event in which the planet's polarity flips and magnetic north becomes magnetic south. The timing raises the question of whether the reversal somehow played a role in the demise of these creatures.

Scientists know very little about why reversals occur and whether they precipitate environmental change. Some geologists have suggested that these events could conceivably wreak ecological havoc—by compromising the magnetic field that shields organisms from deadly radiation, for example, or by confusing the internal navigation systems of migratory birds and other animals that use the earth's magnetic field to orient themselves. As one of the only places in the world that has a terrestrial record of a reversal and a collection of fossils from the same time, Malapa could offer rare insights into what happens when the planet's poles trade places.

Other evidence might throw additional light on their deaths. The fossilized bones of a pregnant antelope and her fetus from Malapa could help scientists pinpoint the time of year that the hominins died to within a couple weeks: antelopes give birth within a very narrow interval in the spring, and analysis of the fetus should allow researchers to figure out how far along the antelope was before she died. Meanwhile traces of maggots and carrion beetles that set on the hominins after death could reveal how long the bodies were exposed before the cave's flowing sediments buried them.

In a sense, the work on *A. sediba* has only just begun. "You're walking all over hominin fossils," Berger tells visitors to Malapa on an austral spring morning in late November. They are standing on the rocky ground between the tree where Matthew found the clavicle and the mining pit where Berger found its owner. Climbing down into the pit, he points onlookers to bits of fossils peeking out of the rock and awaiting collection. The awestruck guests crane to glimpse an infant's arm bone, the lower jaw of a false saber-toothed cat, the area that appears to contain the rest of the young male's skeleton. Just by gathering remains exposed by the miners and the occasional rainstorm, the team has amassed one of the largest fossil hominin samples on record. Once the researchers begin excavating the roughly 500-square-meter site, Berger knows they will find more bones—many more. Extensive planning is under way to erect a structure to protect the site from the elements and serve as a state-of-the-art field laboratory for when they begin the formal excavation later this year, which will probe beyond the miners' leavings into the undisturbed parts of the deposit. Meanwhile, in the Malapa block lab at the University of the Witwatersrand, chunks of rock blasted from the miners' pit fill floor-to-ceiling shelves. Researchers will peer into the rocks with a CT scanner to look for hominin bones, including the adult female's missing skull.

So vast are Malapa's riches that Berger could probably spend the rest of his career working on them. Yet already he is thinking about where he wants to go next. *A. sediba* "has taught me that we really need a better record—and it's out there," he warrants. The mapping project that led Berger to Malapa identified more than three dozen new fossil sites in the Cradle alone that could potentially harbor hominin remains. He is lining up researchers to dig the most promising of those spots. Berger himself has his sights set farther afield. The Congo and Angola, among other places, have cave formations similar to the ones in the Cradle and have never been searched for hominin fossils, he observes. Perhaps there, in paleoanthropological terra incognita, he will find another unexpected emissary from the dawn of humankind that will rewrite the story of our origins once again. SA

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MORE TO EXPLORE

*Australopithecus sediba:* A New Species of *Homo*-like Australopith from South Africa. Lee R. Berger et al. in *Science,* Vol. 328, pages 195–204; April 9, 2010.

The September 9, 2011, issue of *Science* contains five research papers on details of *A. sediba*'s anatomy and age.

**SCIENTIFIC AMERICAN ONLINE**
View photographs and video of *A. sediba* at ScientificAmerican.com/apr2012/sediba