PROFILE MICHEL BRUNET

One Scientist's Quest for The Origin of Our Species

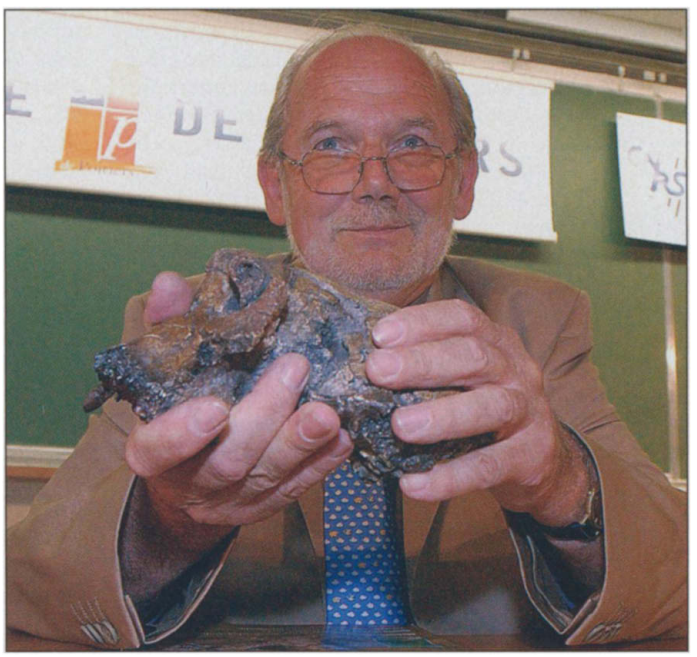
Years of effort in hostile territory finally pay off for French paleontologist Michel Brunet, who discovered a fossil that might be the first member of the human family

POITIERS, FRANCE—The night after Michel Brunet found the jawbone of a human ancestor in the sandblasted desert of northern Chad, he got up twice just to look at it. While his team slept, Brunet shined his flashlight on the precious 3.5-million-year-old jawbone. "I had to make sure it was not a dream," he recalls. "I had been looking for this for so long that I could not believe it was true."

By that January night in 1995, Brunet, a professor at the University of Poitiers in France, had already made his name as a paleontologist's paleontologist, widely respected for his skill in finding fossils in some of the world's most remote and hostile sites. He had been strafed by a fighter jet in Afghanistan, arrested in Iraq, and lost a close colleague to malaria in Cameroon. Yet every year, he returned to the field, leading teams that collected thousands of specimens of all kinds of mammals—extinct monkeys, giraffes, rhinoceroses, hippopotamuses, and pigs. But one type of mammal had eluded him: a hominid, or member of the family that includes humans and their earliest ancestors. Until that January day, Brunet had never held an actual fossil, as opposed to a cast, of an early hominid. So when he cradled the jawbone in his hands, "for me, it was incredible."

As it turned out, that jaw was just a forerunner. In July 2001, a member of Brunet's close-knit team of young French and Chadian researchers dug up a nearly complete cranium in Chad that has been called the find of the century. Many consider this 6-million- to 7-million-year-old skull the earliest known member of the human family. Although a few anthropologists question whether it is a hominid, no one disputes its importance: It is the only known fossil of a primate that lived in Africa when apes and humans had just diverged on their separate evolutionary tracks. When Brunet called his longtime friend and field colleague, paleoanthropologist David Pilbeam of Harvard University, to tell him of the find, Pilbeam predicted: "This will change your life."

In a field peopled by celebrity scientists, it seemed to many that Brunet came out of nowhere. The find of the century was made by a man trained not in hominids but in paleontology—someone with 160 papers in French, German, and English journals on topics such as the predation of dung beetles by termites, an extinct monkey in Afghanistan, and dinosaur footprints in Cameroon. But as Brunet plugged away in fossil beds in Africa, Europe, and Asia, he trained himself to recognize clues from fossils and geology that point the way to hominid terrain. While high-powered teams of anthropologists searched for early hominids in the proven fossil beds of eastern and southern Africa, Brunet scoured the shifting sands of West African deserts, sometimes on a shoestring budget. "He is a very professional scientist who is the industrial standard for being single-minded," says paleoanthropologist Bernard Wood of George Washington University in Washington, D.C.



Hominid hunter. Michel Brunet introduces the Toumaï cranium from Chad as the earliest known human ancestor.

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Now, over a year after the discovery and a few months after the skull dubbed Toumaï was introduced as "The Earliest Known Hominid" on the cover of *Nature* (11 July, article p. 145)," Brunet's life has indeed changed. He has become a paleostar, rocketed to the highest strata of international science. At 62, after a life of being little known outside his field, he is suddenly in demand everywhere. As *Science* shadowed him for several days last month, he was feted and presented with a medal of honor by the president of his region in France; courted by an American documentary producer; asked to autograph a menu by a well-known chef; and bombarded by e-mail requests seeking viewings of the new fossil and his presence at conferences.

All this bemuses Brunet, who in Poitiers, with his neat gray beard, wire-rimmed spectacles, and sweater vests, looks more like a slightly rumpled European academic than an intrepid fossil hunter out of *National Geographic*. "I am French, poor, crazy, a Socialist," he volunteers. But make no mistake: Brunet can be formidable, particularly when his ire is raised in defense of his work or team. "He is very determined," says paleoanthropologist Yves Coppens of the Collège de France in Paris.

The making of a fossil finder

He is also a local boy who made good. During World War II, Brunet lived with his grandmother in a village near Poitiers, 350 kilometers southwest of Paris. He didn't start school until he returned to his parents in Versailles at age 8. So he spent his early years outdoors, developing a love of nature. "I am happiest when I sleep under a blanket looking at the stars," he says.

After college and a Ph.D. at the University of Paris, Brunet joined the faculty of the University of Poitiers and became a specialist in hoofed mammals, tracking their migrations into Europe almost 40 million years ago. It was a respectable, satisfying career for someone who never met a mammal fossil he didn't like, as graduate student Fabrice Limoreau says of Brunet. But then in 1976, Brunet heard of Pilbeam's search for fossil apes in Pakistan. At the time, researchers thought an 8-million- to 13-million-year-old ape, then called *Ramapithecus*, might be an ancestor of hominids.

Brunet, who had studied human paleontology in graduate school, made a momentous decision with his colleague Emile Heintz, a paleontologist at the National Cen-

ter of Scientific Research (CNRS) in Paris: to seek extinct apes across the border from Pakistan in Afghanistan. "I am a *Homo sapiens*, and I want to try to answer: From where did we come?" he says.

Switching to apes meant moving tens of millions of years up the geologic time scale, to the period from 8 million to 5 million years ago, when the earliest human ancestors lived. But although Brunet zeroed in on a promising time and place, searching for fossils is not like collecting shells by the seashore, as he is fond of saying. For every rare hominid fossil, paleontologists usually find thousands of fossils of other animals. In Afghanistan, Brunet's team found many mammals, including rodents and a monkey, but no apes. And the work was dangerous. In 1978, his team was standing on a flat rooftop in Kabul, watching Soviet-made fighter jets strafe the city. One roared low overhead three times and then fired at them; luckily, the pilot missed. Brunet had also begun fieldwork in Iraq, where one day, while seeking a hotel room in a small town, he was arrested—though he never found out why—and then released.

Sands of time. Six million years ago, this desert was Lake Chad, and apes and other mammals prowled its shores.

Westward bound

By 1980, both Afghanistan and Iraq were too dangerous to work in, and Pilbeam had recognized that *Ramapithecus* was no hominid but a likely orangutan ancestor. Yet Brunet was still set on finding hominids. So he and Pilbeam, who by then were working together to analyze the animals that lived alongside *Ramapithecus* in Pakistan, studied the map of Africa.

Starting with Louis Leakey's discovery of a hominid in 1959, all of the oldest hominids had been found in east Africa, at sites of ancient savannas along the Great Rift Valley, with another set of slightly younger fossils turning up in southern Africa. But before 1 million years ago, there were no known hominids from western Africa. This distribution had prompted Coppens to propose that while hominids arose in the savannas of east Africa, other apes, such as the ancestors of chimpanzees and gorillas, clung to the dense forests on the west side of Africa. It was an idea that Brunet longed to test. "The idea was to prove Coppens's hypothesis right or wrong," he says. He and Coppens, 68, had been friends as well as rivals since the 1960s.

Coppens had found many mammal fossils, including a partial skull of a relatively recent (less than 1 million years old) *Homo* in Chad in 1961, and had scouted older sites in the bed of ancient Lake Chad. Brunet thought the fossils suggested that the shores of the ancient lake were a magnet for many mammals, perhaps including hominids. "There was no scientific reason why hominids should not be there," says Brunet.

Brunet and Pilbeam set their sights on two nations with close ties to France—Chad and Cameroon—2500 kilometers directly west of the fossil beds of east Africa. Brunet "plugged away and got little bits and pieces of money from everywhere, including a grant from the government of Poitou-Charentes region to study the effect of goat grazing," recalls Pilbeam. The field permits came through first in 1984 in Cameroon, where the French foreign service had close ties. Brunet sums it up: "Two young guys—one French, one American—decided to go west. Everyone thought we were crazy."

The nine field seasons spent in the jungles of Cameroon, however, were discouraging. They found Miocene sediments but only one lone mammal fossil and no hominids. No hominids meant no more funds, and Pilbeam dropped out. Brunet persisted but paid a terrible price: His close friend, geologist Abel Brillanceau, died of drug-resistant malaria in 1989. For Brunet, the loss was devastating.

But he kept scouting new sites, including some in the desert of Chad, which he toured in a rented car with barely enough water to brush his teeth. Finally, in November 1993, the government of Chad invited him to work in the Djurab Desert, which had been closed to researchers since 1965. By January 1994, Brunet was in the field, "sweeping and sifting" the dunes in what was once ancient Lake Chad, which has expanded and contracted many times over millions of years. He formed a scientific alliance, called the French-Chadian Paleoanthropological Mission (MPFT), with the University of N'Djamena and the Centre Nationale d'Appui à la Recherche, but the logistics were daunting. Says Brunet: "The desert is a wonderful place that can turn very quickly to hell."

Over the past 9 years, the MPFT researchers have dug tents out of sand as if it were snow; worn ski masks as they scoured the sun-bleached lakebed for fossils; and unloaded pallet after pallet of bottled water, trucked in with help from the French army. The fossil beds are in disputed terrain, where warlords have battled during 2 decades of war, and Brunet has been threatened at gunpoint. Metal objects buried in the sand are avoided because they might be mines. "This may be the most difficult to work of any of the hominid sites," says paleoanthropologist Tim White of the University of California, Berkeley.

But the windstorms that can trap researchers in their tents for days are also their allies, eroding 3 centimeters of sandstone a year, sending dunes sailing across the flat desert like waves on a sea, and exposing fossils that have been buried for millions of years. To date, MPFT has found 8000 fossils from more than 300 sites in one part of Chad. That bounty gave Brunet the confidence to predict that he would find hominids, because the gallery forest rimming the ancient lake was clearly the stomping ground for many mammals. Even so, Brunet says it took him years to learn how to find a hominid in Chad, detecting how fossils of a

In the beginning. Michel Brunet began seeking fossil apes in Afghanistan in the 1970s.

CREDITS: (TOP TO BOTTOM) MPFT/CORBIS SYGMA; M. BRUNET

certain size and type present themselves at a particular site, in a particular light. "Sometimes when you are in the field, you see something, you get a feeling," says Brunet.

He got such a feeling that January morning in 1995, when he spotted the 3.5-million-year-old jawbone. Informally, he calls it Abel, for his lost friend; scientifically, he classified it as a new species of australopithecine, *Australopithecus bahrelghazali*. That jaw was the first fossil to show that geographically, there is "a third window" of early hominid evolution—in West Africa, notes Pilbeam. But some researchers question Brunet's naming of a new species, because the jaw "falls within the range of variation" for Lucy's species, *A. afarensis*, says William Kimbel of the Institute of Human Origins at Arizona State University in Tempe. For now, there is no consensus on the jaw's classification.

The first hominid?

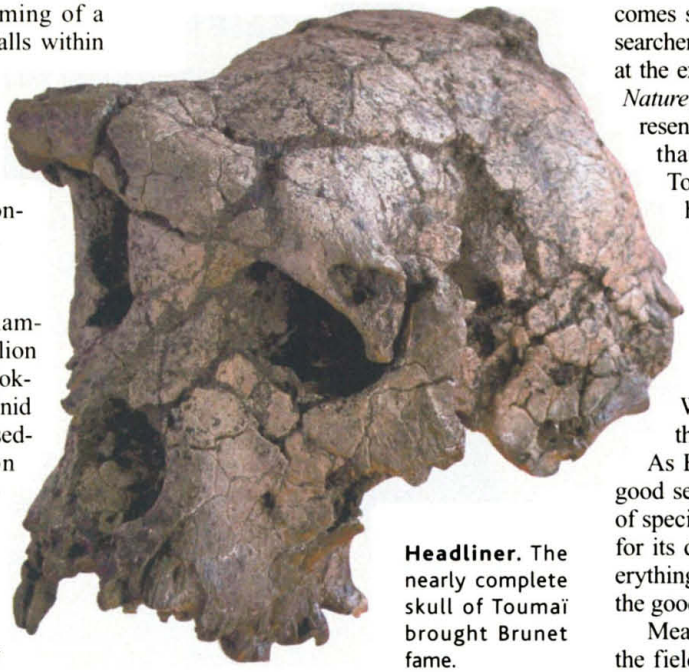
Once Brunet started finding mammals that were more than 6 million years old, he predicted, only half jokingly, that he would find a hominid of that age. "You are working in sediments younger than 6 million years," he said in a playful challenge to White, who has found a rival, younger contender for the earliest hominid. "You are going to lose." Brunet's graduate student, Jean-Renaud Boisserie, recalls: "After the discovery of Abel, he was sure he would discover something exceptional and more ancient than the hominids in east Africa. He was so sure that I was convinced also."

They had to wait 6 years. Then on 19 July 2001, after Brunet had left the field for the season, he got a call from his team: A young Chadian student, Ahounta Djimdoumalbaye of the University of N'Djamena, had unearthed a nearly complete cranium.

When Brunet saw that the fossil's face and teeth resembled those of a hominid, rather than a gorilla or chimpanzee, he knew he had the find of a lifetime (*Science*, 12 July, p. 171). The beds containing the skull had already yielded 42 species of animals, from fish and rodents to wild boar, which were used to date the fossil to between 6 million and 7 million years old, as the desert surface has no volcanic ash for radiometric dating. Brunet is now seeking an oil company to drill a core to collect and date the underlying ash.

No less than the president of Chad nicknamed the skull Toumaï, which means "Hope of Life" in the Goran language, and Brunet classified it in a new genus and species, *Sahelanthropus tchadensis*. Even his rivals were impressed. "I take my hat off to him for achieving what he did in Chad," says Collège de France paleontologist Martin Pickford, who also has found a rival early hominid in east Africa. "It's not an easy place to work."

Nor will it be easy to prove beyond a doubt that Toumaï is a hominid. The partial skull is so ancient that it shows a mixture of primitive features found in apes that came before it and more modern features found in hominids that came later. For example, the brain is small and chimp-sized. But the lower face is flat, like that of later hominids and unlike the protruding snout of chimps and gorillas. Brunet also notes that the upper canines are small and show a wear pattern on top of the first lower premolar like that of hominids, rather than deep sharpening along the edges, seen in gorillas and chimps.



Headliner. The nearly complete skull of Toumaï brought Brunet fame.

CREDIT: MPFT

But not everyone is convinced, partly because different researchers battle over what traits are most important in defining a hominid. "If you define hominids by a reduction in the canines and premolars, then it's a hominid," says paleoanthropologist Carol Ward of the University of Missouri, Columbia. "But if a hominid is going to be defined by walking upright on two feet, you can't tell [if Toumaï is a hominid]."

Indeed, in a letter to *Nature* last month, Pickford and three other researchers argued that upright walking, not canine-premolar shape and size, is the hallmark of a hominid. Pickford and colleague Brigitte Senut of the National Museum of Natural History in Paris repeated their assertions that their find, 6-million-year-old *Orrorin tugenensis*, has signs of upright walking and so is a "more likely" candidate for earliest hominid. In contrast, wrote lead author Milford Wolpoff of the University of Michigan, Ann Arbor, "we believe that *Sahelanthropus* was an ape." The letter's headline suggested that the fossil's genus name, which means Sahel man, should be changed to *Sahelpithecus*, for Sahel ape. And in interviews with the press, Pickford and Senut went even further: They called it a gorilla ancestor.

Such criticism infuriates Brunet. "It is crazy," he scoffs, gesturing irritatedly with a cast of Toumaï in his hand. Although he welcomes scientific debate, he says that the researchers appear to be promoting their fossil at the expense of Toumaï. In his response in *Nature*, he accuses the scientists of "misrepresenting" Toumaï's morphology. He notes that Senut and Pickford have viewed Toumaï only briefly and that Wolpoff has never seen it. "Toumaï is absolutely not a protogorilla!" he says.

On that point, he has a lot of company. "The dental characters that suggest it is a hominid are exactly the characters that make it not a gorilla or other ape ancestor," says White. Agrees Wood: "I don't think there's any chance it is a gorilla."

As Brunet analyzes Toumaï, he has "the good sense," says Wood, to seek the advice of specialists to help mine the hominid skull for its data. "You can't be an expert on everything, so he's playing the field to see who the good people are."

Meanwhile, Brunet is eager to return to the field to find skeletal remains that could illuminate how Toumaï walked. Characteristically, he predicts that even older sites he has found hold the promise of even older primates, such as the common ancestor of chimps and humans.

But Brunet, whose heart is pumping with the help of four stents, is also aware that he is in a race against time. And he is intensely conscious of the price he paid to find a hominid, mentioning the loss of his friend. "People say I am lucky. I am *not* lucky," he claims, throwing up his hands. "I have given too much."

But a few hours later, he is patiently discussing Toumaï with a child at 11 p.m. after a packed public lecture in a small town near Poitiers, clearly enjoying what Pilbeam calls "the hominid aura." To friends who have followed his career closely, it is fitting that this veteran fossil hunter, schooled in the anatomy of mammals and determined to leave no fossil stone or bone unturned, is the one who discovered Toumaï. "It's a beautiful trajectory," says paleontologist Jean-Jacques Jaeger of the University of Montpellier II, "the life history of a mammal paleontologist."

–ANN GIBBONS