

THE LINK

UNCOVERING OUR
EARLIEST ANCESTOR

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CHAPTER ONE

DISCOVERING IDA

In the glow of a gibbous moon, a petite being moves through the palm trees surrounding a lake that seems almost impossibly pristine. The small creature living in this lush tropical forest has a light coat of fur, and she's less than two feet (half a meter) tall. With forward-facing eyes, her elongated head is slightly overproportioned to her body, suggesting intelligence. Her legs are a bit longer than her arms, allowing her to climb trees and move between them to avoid dangers on the ground below.

This is Ida, less than a year old and just weaned from her mother. She now has the freedom to roam, climb, and fend for herself. Moving as though she's chasing down the wind, she pushes off one branch with her feet, using her tail like a rudder to guide her, and then grasps the next branch with her long fingers. She secures her position with her toes, all of which are of nearly equal length and used for nothing except movement. Her opposable thumbs enable her to gracefully grab and go.

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As she searches for her next meal, Ida ignores the varieties of insects, easy targets all, and settles on a piece of fruit. She wraps her hands around the fruit, pulls it from its branch, and pops it into her oblong mouth. Moving her jaw rhythmically, she chews the fruit with her rounded teeth. For a living being, searching for food in any forest would usually be a rather straightforward process—were it not happening 47 million years ago in this particular forest, by this particular lake.

The rain forest where Ida lives would be recognizable to us but not identical to any we have seen. It is a sight to behold, and though its features are relatively common for its time, it's a place that could only have been made by a special confluence of events. It has a warm and equitable climate that stimulates the growth of its plants and trees, making life comfortable for its inhabitants. Palm trees with large root masses shoot into the air, as do cycads, which have a stout trunk at their base and large, tightly wound bundles of leaves at the top. Pygmy horses prance the verdant land. Opossums and armadillos share space with giant mice and salamanders. Birds with woodpecker-like beaks and short wings fill the air, but there are also powerful flightless ground-dwelling birds six feet (almost 2 meters) tall that are feasting on mammals. Large insects protect themselves by imitating tree leaves. Rat-size “longfingers” with tails twice the length of their bodies rip bark from the trees with their two clawlike fingers in hopes of finding insect larvae. Anteaters seethe as they eye giant ants an inch (2.5 centimeters) long, but these ants often make last-second getaways by spanning their wings a full six inches (15 centimeters) and beating a retreat.

In the center of the forest sits the lake, which is an endless source of fascination for the creatures living around it.

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The crater it fills was formed by a volcanic eruption thousands of years before Ida was born. Deep underground, the earth's crust split, sending boiling-hot molten magma rushing toward the surface. Just before the magma broke through the surface, it collided with a layer of groundwater and instantly turned into steam, a process that eliminated all the lava. This reaction caused an explosion that blew out a large chunk of earth and left behind a vast crater a mile (1.6 kilometers) wide and more than eight hundred feet (250 meters) deep known as a *maar lake*.

Over time, the hole filled with a combination of groundwater seeping from below and rainwater trickling down from the heavens, and a lake was created. Though there are a few streams, no rivers flow in and out, so the water in the lake remains relatively still. Because of the lack of currents, the water at the bottom is cut off from the upper layers and unable to draw down oxygen from the atmosphere above. All the fish live near the top, and there are no scavengers prowling the lake floor.

The lake is so rich in algae that from above, it resembles a green eye in the middle of the rain forest. As the surface algae die, they sink to the bottom and turn to slime. Eventually the slime turns to mud. The combination of this heavy mud and an almost total lack of oxygen kills nearly all the bacteria, allowing any creature that perishes and sinks to the bottom to rest virtually undisturbed for eternity.

The lake is the heart of this forest ecosystem, and it sustains a diverse array of life. At the water's edge, enormous crocodiles patrol their territory, and frogs make a *tock* sound as they search for insects. The land frogs have short hind legs and dig for food, while the water frogs have long, thin legs. In

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the water, turtles with paddle-like feet push their way across the surface of the slimy water. Shells are attached to sunken rocks lining the sides of the lake. Repelled by the lack of oxygen at the deeper levels of the lake, the bowfin, perch, gar, and eels swim near the surface. Many of the fish eat hard-shelled prey such as snails.

As Ida moves through this vast array of wildlife, dodging bats and staying out of reach of the saw-toothed crocodile's snapping jaws, it's clear that she is different from the others resembling her. She's much lower in the trees than they are, and at first she appears to be playing with the other wildlife. But as she moves, it's apparent that she's tentative with her right wrist and her left arm.

Amid the tranquillity of this Eden, and the chattering of hundreds of animals and the sounds of a squealing flock of bats, a rumble begins from beneath the lake and quickly becomes a roar, but the animals in the surrounding forest are oblivious to the large gas bubble erupting from deep within the earth's crust.

At that moment, Ida is leaning down for a drink from the lake, grasping the shaft of a palm tree with one hand and reaching to cup the water with the other. She seems apathetic about the disruption.

The perfectly shaped oval bubble races up through hundreds of feet of water, killing almost instantly everything swimming in it, and finally releases a thin layer of dense gas as it breaks the surface. The gas is heavier than ordinary air, so it clings to the ground, covering the water's surface and creeping across the low-lying ground.

Ida detects the malodorous fumes. All the creatures do. Like them, she reacts immediately, but her arm is not strong

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enough to quickly pull herself up and away from the water's edge. The gas engulfs her airspace. She doubles over into a fetal position, slips into unconsciousness, and collapses into the water along with all the others in the vicinity.

Lifeless, Ida sinks to the bottom of the lake and comes to rest in the mud. The natural lifecycle of one young being is complete. But because of the wondrous oddities that make up the time, place, and circumstances of Ida's death, she might leave an indelible mark on history, more than any being that lived within millions of years of her.

Forty-seven million years later, Earth has changed. The Indian tectonic plate has collided with the Asian plate, resulting in the formation of the Himalayas. The polar ice caps have formed. The modern continents have taken shape, and climate change has occurred—many times. Humans have evolved. And, in a relative blink of time, the modern history of man—the development of civilization, the agricultural, industrial, and technical revolutions, and the fighting of wars—has occurred. All this as Ida lay still in the earth.

Today's Earth looks very similar to the Eocene Earth, but the two are not identical. The shifting of the continents over millions of years has moved the tropical forest's crater lake 150 feet (45 meters) beneath the Earth's surface and relocated it from what is now the Mediterranean Sea in the area of Sicily to about twenty-two miles (35 kilometers) southeast of Frankfurt, Germany, near the village of Messel. During this time, the weight of the thick mud has compacted the layers of dead algae into an oily shale and flattened the remains of thousands of creatures that died there, including Ida.

The oily shale deposits were discovered by coal prospectors

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in the eighteenth century, and the quarry, now named the Messel Pit, became the site of furious activity when a process to convert the shale into raw petroleum was perfected. On December 30, 1875, the Messel Pit provided its first hint that something special was buried there when the bones and jaw fragments of a crocodile were found. Even as there were fossil recovery missions on an ad hoc basis through the 1900s, the mining continued unabated. Somehow, in all the frenetic digging, Ida's remains were missed.

Finally, in 1966, formal Messel Pit excavations were undertaken by paleontologists and archaeologists. Fossils of horses, fish, bats, and crocodiles perfectly frozen in time were unearthed and preserved. In many cases, complete skeletons were preserved, along with bacterial imprints of hair, feathers, scales, and even internal organs. But the discovery of the first primitive horse caused day-tripping fossil hunters armed with rock hammers, wire brushes, and tiny cleaning towels to ravage the pit in search of keepsakes or that rare find that they could sell on the open market. Layer by layer, tons of shale were removed, and the depth of the pit was soon almost two hundred feet (60 meters).

By 1971, mining had ceased, crippled by competition from cheap oil imports. That year, the German government, which wasn't benefiting financially from the fossil expeditions, decided the pit was an eyesore and declared that it would become a landfill. An access road was even constructed, but the scientific community protested and launched an all-out campaign to save the historic site. The protest delayed plans for a landfill and left the pit open to fossil hunters until a resolution could be reached. Messel's possible destruction sparked a fossil rush. Both scientists and collectors tried to haul as many

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fossils as they could out of the pit as quickly as possible, and it was a case of finders keepers.

Sometime in 1982, on a routine day for most of the world, a man living on the outskirts of Frankfurt went on a day expedition to the pit to add to his private fossil collection. Unlike those who had pillaged the sacred quarry, he took great care in his work and preserved each fossil on site like a scientist.

While splitting the layers of shale, the fossil hunter stumbled on a fossil of what looked like an exotic monkey crushed to the thickness of a silver dollar. It was Ida, frozen in a fetal position, exactly as she had come to rest on the bottom of the lake.

He realized that he was onto something. He carefully extracted the fossil from the ground and diligently wrapped it in wet newspaper. He then returned to his house and probably employed an expert to prepare the fossil—its preparation is so skillful that just a handful of people in the world could have done it. It must have taken months of careful chipping away the shale and stabilizing the bones before the specimen was ready to be placed on a shelf in his basement with the others he had excavated, away from the eyes of science and the public, for him alone to see.

Fossil collectors can be an obsessive bunch, much like art collectors who hoard famous masterpieces. Many of them merely want to own precious world treasures without telling anyone that they have them in their possession. Some want to withhold them from scientific study. Others are competing for attention in an underground society. For whatever reason, the private collector who found Ida's fossilized remains simply put her on a shelf for the next twenty-five years.

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Roughly 250 miles (400 kilometers) north of the Messel Pit, the second-largest fossil fair in Europe is held each December in Hamburg, Germany. In 2006, thousands of people attended, and dealers from all over the world peddled their wares. The fair attracts a diverse crowd. Scientists in tweed sports jackets with elbow patches look for specimens for their museums. Private collectors prowl for that one special snapshot of time. Dealers look for items that can be sold on the black market. And, because of the time of the year, locals shop for unique Christmas presents.

The fair takes place in an exhibition hall that covers half a square mile. Rows of tables display polished stones, diamond crystals, and fossilized animal parts dangling from necklaces. Wall-size plates of rock with imprints of exotic fish are propped up for viewing. To the untrained eye, the fair looks like nothing more than table upon table of rocks. To the trained eye, sometimes that's exactly what it is. Often the best specimens are not on display but rather held by dealers under the tables or in their cars for those who will truly appreciate them—and for those who will pay.

Jørn Hurum, associate professor of paleontology at the Natural History Museum at the University of Oslo, is a regular at the Hamburg fair, where he goes each year in hopes of adding to his museum's collections. He has traveled the world, looking for connections between species. At age forty-one, he has the rugged look of an explorer who spends a lot of time in remote areas of the planet. His long hair is pulled over his forehead, and he has a sturdy build. His bright eyes reveal a childlike enthusiasm for his craft that dates from his youth.

Hurum grew up outside Oslo, and from the age of six he knew that he wanted to be a paleontologist. The moment

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came when his parents were reading him a story about a boy who was walking on the shore, throwing stones into the sea. In the story, one of the stones says to the boy, “Don’t throw me into the sea. I’m a fossil. I can tell you a story.” The stone, a 500-million-year-old trilobite that existed before fish and dinosaurs, starts to tell the boy about how life evolved over millions of years. Hurum was so taken by the story that he wanted to know everything about fossils, and a lifelong passion emerged.

Hurum studied paleontology at the University of Oslo as an undergraduate, earned his PhD in 1997, and has since become an associate professor in vertebrate paleontology at the university. In 2006, Hurum led a team that described the fossil of a plateosaurus buried more than one mile (1.6 kilometers) beneath the earth’s surface. The dinosaur, estimated to have been thirty feet (9 meters) long and weighing four tons, lived 200 million years ago, during the Triassic period. His later fieldwork in the Svalbard archipelago, located in the Arctic Ocean midway between Norway and the North Pole, resulted in the mapping of forty skeletons of Jurassic marine reptiles and the excavation of six skeletons. His team’s greatest find was a large 150-million-year-old sea reptile. This fifty-foot (15-meter) pliosaur, dubbed “the Monster,” is the longest pliosaur known to science, with a body of forty feet (12 meters) and a skull measuring ten feet (3 meters).

When Hurum arrived at the Hamburg fair in December 2006, he had no idea that this routine trip would change his life. Early one afternoon, Hurum and his museum colleague, Dr. Hans Arne Nakrem, were milling around the table of a reputable dealer named Thomas Perner. Hurum had bought several small specimens from Perner over the years and had

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developed a working relationship with him. But when Hurum caught sight of Perner, he noticed the dealer was staring at him and acting strangely. To Hurum, Perner looked like a man burdened with a secret that he needed to reveal.

Finally Perner approached Hurum and whispered, "I need to show you something so interesting and unbelievable, but there are too many people here at the moment. Can I buy you a drink at four o'clock?"

Hurum immediately accepted. Perner was very reliable, so Hurum was certain he had a worthwhile specimen to show him. But why the secrecy? he wondered. He presumed it was a Messel specimen, possibly of a horse.

Hurum and Nakrem returned to Perner's table at four P.M., and the three of them walked to a small bar inside the exhibition hall. The bar's specialty was fresh-squeezed fruit juice, and Perner ordered three mixed juice and vodkas.

Surrounded by temporary exhibition curtains and attendees wearing name tags, Perner explained to Hurum that a private collector who demanded anonymity had given him six months to sell the fossil he was about to show him. The collector was getting on in years, and he wanted to remain unknown so he wouldn't be harassed for not having put it into the scientific world earlier. Perner then opened an envelope and pulled out a high-resolution color photograph of a complete fossil skeleton. His nerves turned to relief as he shared his secret with Hurum. "This fossil needs a good home," he said. "When I gained access to the fossil, I was very excited about it going to scientific research."

The photograph was of Ida, fossilized after her tragic death.

Hurum was shocked. He knew right away that he was looking at a primate, the order of mammals containing humans,

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because the big toe was standing out from the foot and the fingers had nails instead of claws. Since the fossil appeared so complete and well preserved, he knew that it had probably come from the Messel Pit. The site had produced some of the world's most complete and articulated fossils, but this one was truly remarkable. The unique geology of the pit allowed him to conclude that the fossil was from the Eocene epoch, or the dawn of recent life. If he was right, it could represent a major scientific breakthrough.

The Eocene, which lasted from 55.8 million to 33.9 million years ago, was a crucial turning point in evolution. Though dinosaurs and mammals had coexisted briefly, the world belonged to mammals now. The first prototypes of the creatures that modern man shares the planet with were emerging, notably the primitive primate. Although, because of gaps in the fossil record, paleontologists have had to hypothesize about what happened after the primitive primate, they have determined that by 40 million years ago, there were, as we know, two distinct primate groups: those with wet noses—lemurs and lorises; and those with dry noses—tarsiers and apes and monkeys.

At some point during the Eocene, this important split in primate evolution occurred; without it, humankind as we know it would not exist. Until the fossil in the photograph was found, no complete skeleton had ever been discovered of an “in-between” species to prove this split. Hurum was fast concluding that the specimen he was looking at could be one of the holy grails of science—the “missing link” from the crucial time period.

Hurum marveled as he studied the picture. She was lying on her side, so Hurum could see one foot and the hands. He could see impressions of the rounded fingertips so typical of

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nail-bearing fingers. Even the tiniest vertebra was visible. He could see the tail clearly, as well as the fur on the body. The jaw was intact, and it appeared that the teeth were too, which he knew was of great scientific importance because teeth hold the greatest clues to an animal's lifestyle. The shape and stage of the teeth can reveal the age and the diet and also verify that a fossil is of a primate. Amazingly, he could also see the stomach content, evidence of the last meal. She almost looked alive.

"This is so beautiful," he said, having tuned out the fair swirling around him. "It's like finding the lost ark."

The find represented a once-in-a-lifetime experience for any paleontologist. Nobody had ever seen anything at all like it before, except for the private collector who owned it, Perner, and now Hurum and his colleague. After Perner showed him pictures of the hands and one of the feet, making it clear that the specimen had the fingernails and opposable toe of a primate, Hurum knew he had to protect the fossil at any cost.

But the asking price was steep—\$1 million. The Oslo Natural History Museum had never paid more than \$15,000 for a fossil. Hurum asked Perner to give him until after Christmas to talk to some of his contacts to see if he could raise the money—provided the fossil was genuine.

Hurum couldn't sleep for the next two nights. He tossed and turned, hoping the fossil was real and wondering how he was going to bring this discovery to the world. There were strict rules when it came to fossils like this because so much illegal private collecting went on around the world. Hurum would not be able to formally describe this fossil in any scientific work unless it was legally collected and placed in an official museum. This was to make sure that other scientists

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could also access the specimen in the future. He knew of complete fossilized dinosaurs that would never become part of the scientific record because they had been collected illegally and were now in the hands of private collectors. He didn't want this fossil to fall into that category.

First he would have to raise the money. The Oslo museum was clearly his first choice, but he was worried that, since the University of Oslo was its primary funding source, it wouldn't be able to put up the money. He began to think of other museums with wealthy sponsors that he could call. He would need to hire the most reputable scientists to conduct CT scans and X-rays to prove the fossil's authenticity. Once that was finished, he would need to enlist other experts in Eocene primates and the Messel Pit to describe the specimen. They would all have to work in unison and then present their findings to the scientific community, which was certain to have its skeptics.

Crucially, Hurum would have to make sure that it was a legal specimen, meaning that it was excavated before the Messel Pit became a protected UNESCO World Heritage Site in 1995. Permits to export it from Germany to Norway would also need to be secured. If the fossil was collected after 1995, it was unlikely that it would ever be allowed to leave the country.

But despite the challenges ahead of him, Hurum knew he must see the fossil in person and ultimately relocate it to a public museum for study and observation. The work he had to do seemed insignificant in the face of his strong hunch that he was about to come face-to-face with the most complete primate fossil ever found—maybe even that of a human ancestor.