

Ida: A link to human evolution

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Abstract: Year 2009 is being celebrated as the bicentenary of British naturalist Charles Robert Darwin's birth as well as 150 years of his book "*On the Origin of Species by Means of Natural Selection, or The Preservation of Favored Races in the Struggle for Life*" in short "*On the Origin of Species*". Darwin is hailed as one of the greatest scientist who put forth the theory of gradual evolution and branching of all life forms. Unfortunately, then fossil records were incomplete to produce evidence of human evolution. For 200 years paleobiologists were looking for any evidence of a transitional fossil to showcase the evolution of monkeys, apes and human. The story of Ida began in 1983 when she was collected from Messel pit in Germany by an unknown collector, and displayed in his home for 20 years before deciding to sell. The fossil Ida was preserved in nature for ages in the Germany's Messel pit, a crater rich in Eocene Epoch fossils. Ida lived when major changes were taking place on earth, the dinosaurs had become extinct, the Himalayas were forming and a range of mammals thrived in vast jungles all over the world. Prof. Jørn Hurum of the Natural History Museum, University of Oslo, Norway bought the fossil for 1 million USD, assembled top international team of experts, studied the fossil secretly for 2 years, and satisfied themselves as to the genuineness of the fossil. Finally Prof. Jørn Hurum announced the discovery of 47 million years old fossil - a link in the evolution of monkeys, apes and man. He named the fossil "Ida" and her scientific name is *Darwinius masillae* (named in honor of Charles Darwin's bicentenary). Ida will remain for long a subject of intense research and discussion almost throughout the world. The fact that all life forms have common ancestors at some point of time is a well established universal reality as unfolded by research on DNA.

Keywords: Darwin, Evolution, *Darwinius masillae* (Ida), Paleobiology, Primate, Religion

Introduction

Prof. Jørn Hurum of the Natural History Museum, University of Oslo, Norway announced the discovery of Ida - the missing link that led to the evolution of monkeys, apes and man (Ida, pronounced "ee-dah"). This breakthrough

announcement was well timed coinciding with the bicentenary celebrations of English naturalist Charles Darwin. It is noteworthy to mention that Darwin for the first time gathered evidence of evolution by natural selection, and said “that species change over time through the selective retention of beneficial traits, gradually evolving into new species. In this way, all species alive today are descended from common ancestors”. In November 1859 Darwin published his ground breaking theory “*On the Origin of Species by Means of Natural Selection, or The Preservation of Favored Races in the Struggle for Life*” in short “*On the Origin of Species*”.¹ At that time there were major gaps in the fossil records. Darwin acknowledged that the lack of fossil evidence of the intermediate transitional fossils is a serious problem between species posed a problem, and “this was the most obvious and gravest objection which can be urged against my theory”.¹ Two years later in 1861 the first transitional fossil *Archaeopteryx*^{2,3} was discovered. Thereafter, evidence has been collected that unambiguously brings out the intermediate form in major animal groups. For example, the finding of *Archaeopteryx* has supported the intermediate forms between dinosaurs and birds. As Prof. Jørn Hurum explains, Darwin said a lot about transitional species and how they were missing from the geological record. Quoting Darwin he said “that if a transitional species is never found, his whole theory will be wrong”. Explaining the importance of Ida, Prof. Hurum said that “for the last 50 years we’ve gained a deeper and deeper understanding of species that show transitions between large groups of mammals. Ida is very comparable to some of the most significant fossils that have been described like Lucy,⁴ the Neanderthals,⁵ *Tyrannosaurus rex*⁶ and *Archaeopteryx*.³ It’s a really important specimen that will become an icon of evolution. So I think Darwin would be really happy about this specimen”.

The discovery of “Ida”

Fossil Ida was unearthed in 1983 by a private fossil hunter from Grube Messel pit near Frankfurt, Germany (Fig. 1). The village Messel is located about 35 km south-east of Frankfurt and the word masilla is the name of a 9th century monastery where the fossil was found. The Messel site has yielded hundreds of superbly preserved fossils including eight species of crocodile, 20 or so snakes, more than 60 specimens of pygmy horse, more than 1,000 bats, insects with colored pigments on their wings still visible, the largest ant ever to crawl the planet, and eight fragmentary primate specimens. Messel is now UNESCO’s world heritage site. At the time of Ida’s finding, the German collector (anonymous) had no idea of how valuable the fossil is. The fossil was preserved in a polyester resin and hung for 20 years in his home, and admired like the painting of Vincent Willem van Gogh. The fossil was split and sold in two parts separately; a lesser part was purchased for the private museum in Wyoming, USA. Prof. Jørn Hurum, was the first to recognize the significance of the fossil. The fossil was reassembled in 2007



Figure 1. Left: An artist's reconstruction of the Eocene period ecosystem shown on left side. Credit: Christopher Klein and Mark Hallett. At the upper left corner is an adapoid primate, *Europolemur*, a close relative of *Darwinius*. Right: Messel pit site in Germany-UNESCO's world heritage site. Credit: Atlantic Productions http://blogs.ngm.com/blog_central/2009/05/darwinius-and-the-real-missing-link.html

and now belongs to the Natural History Museum, University of Oslo, Norway.⁷ In 2006 Thomas Perner, a private collector facilitated the deal of *Ida*. He showed the fossil to Prof. Hurum at the annual Hamburg Fossil and Mineral Fair in Germany. Prof. Hurum was amazed at the “most beautiful fossil worldwide”. This to him looked like a blue print of human evolution. The asking price was more than \$1 million (£660,000), almost 10 times the normal value of such a fossil. After 6 months of negotiations Thomas Perner brokered a \$1 million (£629,000) deal of the 47 million years old fossil in a vodka bar in Hamburg. An international team of scientists headed by Prof. Hurum at the Natural History Museum have studied this fossil for 2 years before making an announcement. The fossil is named “*Ida*” after Prof. Jørn Hurum's daughter who in maturity is equivalent to his 6-year-old daughter *Ida*. *Ida*'s scientific name is *Darwinius masillae* given in honor of English naturalist Charles Darwin. The discovery of the 95% complete ‘lemur monkey’ *Ida* is described by experts in detail, and their final conclusion was that *Ida* is completely genuine and authentic (Fig. 2). The fossil was amazing and awesome. Such a well preserved specimen has never been encountered anywhere in the world. The fossil belongs to Eocene era and *Ida* (she) lived in semi-tropical forest 47 million years ago. *Ida* was preserved in the oil shale. This shale consists of soft finely stratified rock of mud or clay and easily splits. The fossil is 95% complete and perfectly preserved. In contrast “*Lucy*” which was thus far the most reliable fossil evidence for direct descendent of man. *Lucy* was found in Ethiopia, is 3.18 million years old and only 40% complete. *Ida*'s fossil shows soft body outline as well as the preserved gut contents of seeds, fruits and leaf but no insects. *Ida* when died was a juvenile female, 6–9 months in age, 58 cm (23 inch) overall length of the body and about 24 cm (9.4 inch) tail. *Ida* as an adult would have weighed about 1 kg, but she was probably 60% of her adult body weight. *Ida* was perhaps a nocturnal with large eye holes in the skull.



Figure 2. (Left) Dr Jens Franzen and Dr Jørn Hurum studying Ida the fossil. Photograph: Sam Peach/Atlantic Productions, and (Right) Fossil Ida: Photo credit: Atlantic Productions Ltd.

She is female as she does not have a penis bone. She has talus foot bone present in the humans. She has nails rather than the claws. Her teeth are similar to those of monkeys. Her forward facing eyes are similar to humans. This allows her 3D vision and ability to judge distances. Ida has five fingers on hands, short arms and legs. It lacks a grooming claw and fused row of teeth known as a toothcomb a characteristic feature of Lemur. It is notable to mention that Ida fossil is 20 times older than other fossils used as evidence of human evolution. Prof. Hurum said that the impact of Ida on the world of paleontology will be “somewhat like an asteroid falling down to earth”. Because Ida fossil was so complete, it was also described as a “Rosetta stone”.⁸ “This fossil “promised to change everything that we thought we understood about the origins of human life”.⁹⁻¹¹

The discovery of fossil Ida ends 200 years search of the evidence of evolutionary history of *Homo sapiens*. The team headed by Prof. Hurum announced the discovery of Ida on May 19, 2009 at the American Natural History Museum, New York. Announcing the discovery Hurum said “It is something about owning a part of history, that you know when you show it to people it will change things ... It is a powerful feeling to have something ... nobody knows about.” Prof. Hurum declared that Ida was “the most complete fossil before human burial”. Hurum showed pictures of the Mona Lisa and the Rosetta stone, making a point about the importance of “Ida”, and he called it the Holy Grail and the lost ark of paleontology.¹² Sir David Attenborough said, while narrating the documentary on “Ida” at BBC. “This little creature is going to show us our connection with the rest of all the mammals - with cows and sheep, and elephants and anteaters.” “The more you look at Ida, the more you can see, as it were, the primate in embryo.¹³” Because she is so complete, the scientists who have studied Ida describe her as a “Rosetta stone” for making sense of early primate evolution. “[She is] the eighth wonder of the world¹⁴” said Jens Franzen,⁹ at the Senckenberg, who is another co-author of the paper, describing the fossil in the journal PLoS ONE. Further Hurum said: “This is the first link in human evolution. A find like this is something for all humankind. It tells a part of our evolution that’s been hidden so far”. “This

is our Mona Lisa and it will be ... for the next 100 years.^{13,15} “This little creature is going to show us our connection with all the rest of the mammals. The link they would have said until now is missing ... it is no longer missing.” Renowned broadcaster and naturalist Sir David Attenborough. The day after the Ida launch UK-based Guardian newspaper featured a front-page article under Sir David Attenborough’s personal by-line which is reproduced below.¹⁶

“Humanity is very egocentric. We are fascinated with ourselves. I’m not sure that it is a particularly nice characteristic but we are. When we look round at the natural world, there is often an ulterior motive. We desperately want to know where we came from...” ...and later continued, as part of the layout of a special two-page spread about the discovery. “...The more you look at Ida the more you can picture, as it were, the primate in embryo. She represents the seed from which the diversity of monkeys, apes and ultimately every person on the planet came...”

Importance of Ida

The fossil Ida or *Darwinius*, was officially revealed on May 19, 2009 at New York’s American Museum of Natural History. On May 20, 2009 a day after the announcement in New York, Google’s search page featured “Ida”, and on clicking the logo, one automatically reaches at the “missing link” (Fig. 3). Simultaneously a book, a movie, a press release, news reports, TV special and an interactive web site were all launched to tell the world that in Ida the “missing link” of the man’s evolution has been found.¹⁷



Figure 3. *Darwinius masillae*, the fossil known as “Ida” was displayed on Google’s search page

The Ida fossil is more similar to anthropoids, the group that includes apes, monkeys and humans. Ida lived around the time when primates split in to prosimians or the non-human branch who have survived as the modern lemurs; and the monkeys, apes and humans evolved from the other branch known as anthropoids. Ida has anthropoid features placed within the primate family tree. Prof. Jørn Hurum said she is perhaps a transitional fossil between primitive lemur-like primates and the monkeys, including the human lineage. “This is the first link to all humans – truly a fossil that links world heritage,¹⁷” he said: “This fossil rewrites our understanding of the evolution of primates... It will probably be pictured in all textbooks for the next 100 years”.¹⁵ As a primate, Ida is part of our own order, and able to throw light on our own ancestry. She comes from

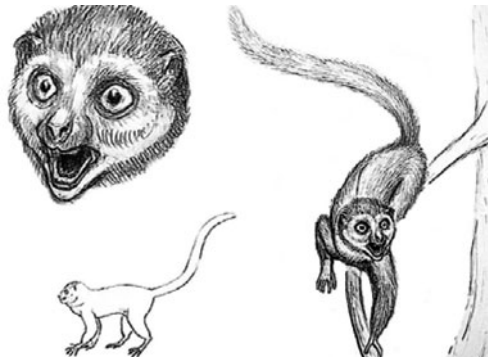


Figure 4. Sketch of *Ida* are published by the research team on the Public Library of Science website. Creative Commons Attribution License Franzen et al.⁹

a highly significant age—the time when the anthropoids, our own subgroup of primates, were branching off from the prosimians” (Fig. 4).

Darwin was ridiculed for his thesis on evolution. On the November 17, 1877, Charles Darwin was awarded an honorary doctorate by Oxford University. As he headed towards the podium, unruly undergraduates unfurled a giant banner of half-man half-monkey titled “Missing Link”. Such was the feeling against his monumental contribution to science. The notion that humans were connected to other animals was causing hurt in the Christian society (Fig. 5). When Darwin told the Bishop of Worcester’s wife about his theory of evolution, she remarked: “Descended from the apes! My dear, let us hope that it is not true, but if it is, let us pray that it will not become generally known”. On the bicentenary of Darwin “Pope has now argued that man descended from apes, and natural selection was the means by which some species prospered while others failed”. In 2009 Rev Dr Malcolm Brown, Director Church of England issued this statement “Charles Darwin: 200 years from your birth, the Church of England owes you an apology for misunderstanding you and, by getting our first reaction wrong, encouraging others to misunderstand you still. We try to practice the old virtues of ‘faith seeking understanding’ and hope that makes some amends.”¹⁸

Discussion

The theory of evolution by natural selection as outlined by Charles Darwin is now widely accepted. During Darwin’s period, fossil records were few and that was the biggest obstacle in convincing skeptics. In the last 150 years fossil records have unambiguously proved Darwinian evolution. But during his period Darwin had to face the wrath of the Church of England for his theory of evolution as it was considered against the divine creation. Today as we celebrate the bicentenary of

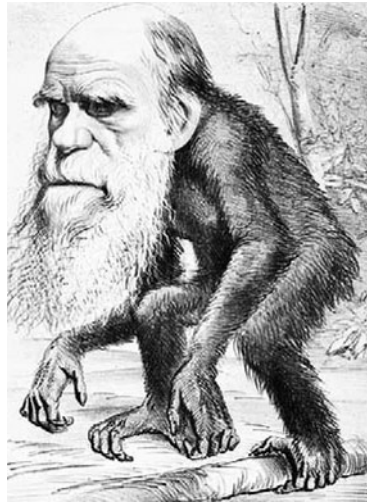


Figure 5. Caricature of Charles Darwin as an ape published in *The Hornet*, a satirical magazine 22 March 1871. University College London Digital Collections, Author unknown. This caricature shows Darwin with the body of an ape. As “Darwinism” became widely accepted in the 1870s, caricatures of Charles Darwin with an ape or monkey body symbolized evolution¹⁹

this great man his views on religion stand vindicated by the Church of England.¹⁸ There are still missing specimens in the chain of evolution of various animals and plants. The search for more fossil evidence would profoundly affect the young minds. Even for atheists it may be recalled that Genesis 1 states, “And God said, let the earth bring forth the living creature” and “Let the waters bring forth abundantly.” This allows the teaching that God let the earth and waters do its thing and create life, which would not contradict Darwinism or religion. As Editor in Chief, National Geographic magazine Bill Allen states in his letter from the Editor “National Geographic aims to explore the world, often by highlighting scientific concepts such as evolution. Is this approach necessarily at odds with faith, which lies beyond the possibility of scientific proof? No. Just as religion did not disappear after Galileo demonstrated that the earth is not at the center of the solar system, evolution does not exclude God from our origins, the ‘mystery of mysteries’—a 19th century astronomer’s description borrowed by Darwin himself”.¹⁹

Jørn Hurum explains evolution for all life forms, “When we say that *Ida* is related to all the monkeys and apes that live today, at the same time we’re saying that they all have separate lines of evolution. Chimpanzees, gorillas, orangutans and lemurs all have the same amount of evolution as humans do. We just evolved in different directions. The beauty about the theory of evolution is that we all have a starting point somewhere, and then the ancestors go in different directions (Fig. 6). What we see with specimens like *Ida* is something about the

How Ida fits into the primate family tree

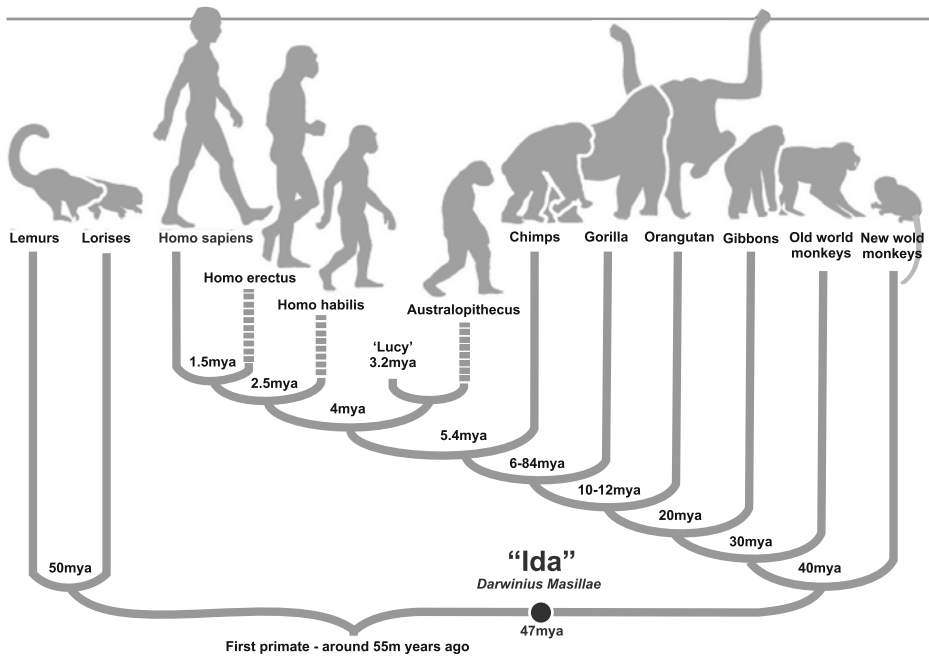


Figure 6. Showing the place of *Ida Darwinius masillae* in the primate family. Humans first walked on earth 190,000 years ago in the 4.5-billion-year history of earth. http://image.guardian.co.uk/sys-files/Guardian/documents/2009/05/20/Primate_tree.pdf

deep evolution of all primates - we have a common ancestor somewhere down the timeline. All of us.”

Primates have evolved 55 million years ago and between 40 and 50 million years ago a branching took place splitting apes, monkeys and humans from the second group that includes lorises and lemurs. *Ida* lived during the Eocene period. This period began about 55 million years ago and by this time 10 million years had lapsed since the dinosaurs had become extinct. *Darwinius masillae* “*Ida*” lived some 47 million years ago in the middle Eocene (in Greek “New Dawn”) period, and dinosaurs disappeared some 18 million years ago before Eocene. It was in the Eocene period that the first large land mammals appeared on the earth. This was the period when warm-blooded animals continued their evolutionary transition to the biodiversity in animal life we see today. Decent of man continued selecting for favorable mutations resulting in modern man (Fig. 7).²⁰

Ida may belong to our own primate ancestry that led to monkeys, apes and man, but the announcement of “*Ida* - the missing link” has become controversial. It may be noted that evolution proceeds via incremental changes. The fossil record of each change is incomplete. Skeptics are still cautious in accepting this

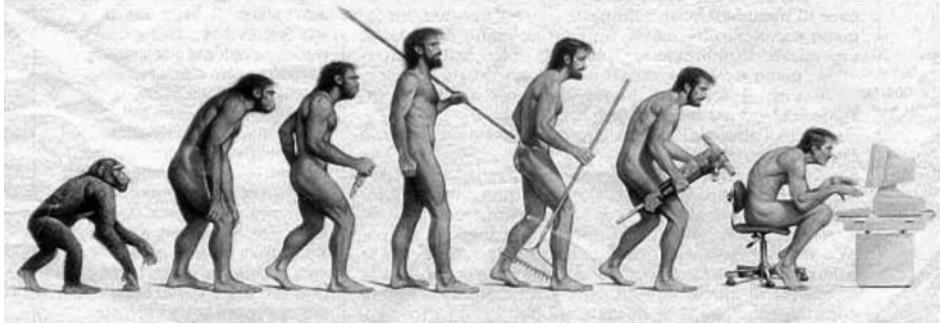


Figure 7. Evolution of monkeys, ape and Man²⁰

as the missing link.²¹ Primatologists interested in evolution were conspicuously absent at the news conference and most of them believe that Ida was the ancestor of lemurs, not humans. John Fleagle Professor at Stony Brook University, New York who reviewed the manuscript before publication state “that the fossil is not a lemur but a link in the evolution of man”. Ida’s full significance would emerge only after it has been debated extensively among the paleontologists in the coming years. While final verdict will take time, it is safe to avoid the word “missing link”. Ida will remain an important discovery of great importance as there are very few fossil records from this Eocene (in Greek “New Dawn”) period. Finally as we go to press, debate on the “Ida’s” place in evolution is becoming murkier. A group of paleontologists writing in *Nature* (Lond.) claim that 47 million years old fossil *Darwinius masillae* belongs to lemurs and lorises. Nonetheless we believe that not in too distant a future such an undisputed fossil in the lineage of monkey, ape and man would be found;^{22,23} and until such time DNA story²⁴ has already clinched the issue.

Darwin’s theory of evolution has stood test of time, and has proved to be of invaluable help in explaining the various new pathogens causing pandemics. Work of Watson and Crick²⁴ that every organism carries a 4-letter code of DNA²⁵ common to all life, vindicated Darwin’s theory of evolution. For example, chimpanzee and human genomes are highly related. Such similarities based on genome analysis of various animals and plants have proved to be a boon in understanding common descent. Further advanced genetic research is marching ahead to solve the problem of hunger and health in man and animals. The evolution of various microbes is causing serious human health problems world over. In the last decade or two about 30 new microbes or their malignant forms have appeared and caused high morbidity and mortality, and heavy economic losses. The examples are plague, AIDS, Ebola virus, SARS, H1N1 viral influenza, tuberculosis, malaria, West Nile virus, Japanese encephalitis et al. By the process of mutations and natural selection they acquire resistance to chemicals that were initially very useful.

These organisms change to new and more dangerous forms, and some also jump from animals to man. To watch the entire panorama of plant and animal life, consequences of biodiversity loss, and emergence of lethal organism is mind boggling. Darwin would have been thrilled to see “the nature at work”.

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