

# Ancestor or Adapiform? *Darwinius* and the Search for Our Early Primate Ancestors

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**Abstract** On May 19, 2009, an international team of scientists claimed to have found one of our early primate ancestors. Dubbed *Darwinius masillae*, the 47 million-year-old primate was presented as “the link” that bridged a gap between early primates and our anthropoid progenitors through a major media campaign, yet details about the way the fossil was acquired, the role media companies played in the presentation of the fossil, and disagreements about the fossil’s interpretation generated a controversy in which scientists, journalists, and science bloggers all played important roles. These debates were reinvigorated in the fall of 2009 when an independent team of researchers described a related fossil primate named *Afradapis longicristatus*, the study of which suggested that *Darwinius* was much further removed from our ancestry than had been initially proposed. The discussion of these fossils will no doubt continue, but the “*Darwinius* debates” of 2009 are significant in that they precipitated a long-awaited analysis of early primate relationships, illustrated the benefits and pitfalls of “going broad” with new discoveries, and exhibited how science blogs can work with traditional media outlets to counter exaggerated claims.

**Keywords** *Darwinius* · *Afradapis* · Adapiform · Anthropoid · Early primate evolution · Science blogs · Science communication

## Introduction

The publication of Charles Darwin’s *On the Origin of Species By Means of Natural Selection* on November 24,

1859 was a major turning point for paleontology. Even though many paleontologists expressed doubts about the efficacy of natural selection to drive evolutionary change (Bowler 1983; Rudwick 1976; Switek 2010), Darwin’s abstract inspired paleontologists to search for fossils that possessed features which were transitional between one species and another. Indeed, since that time, the search for “transitional fossils” has been a major concern for paleontologists, even more so after natural selection and paleontology were reconciled by scientists such as G.G. Simpson (1944) in the mid-twentieth century, and no group of fossil organisms has garnered as much attention and controversy as our own ancestors.

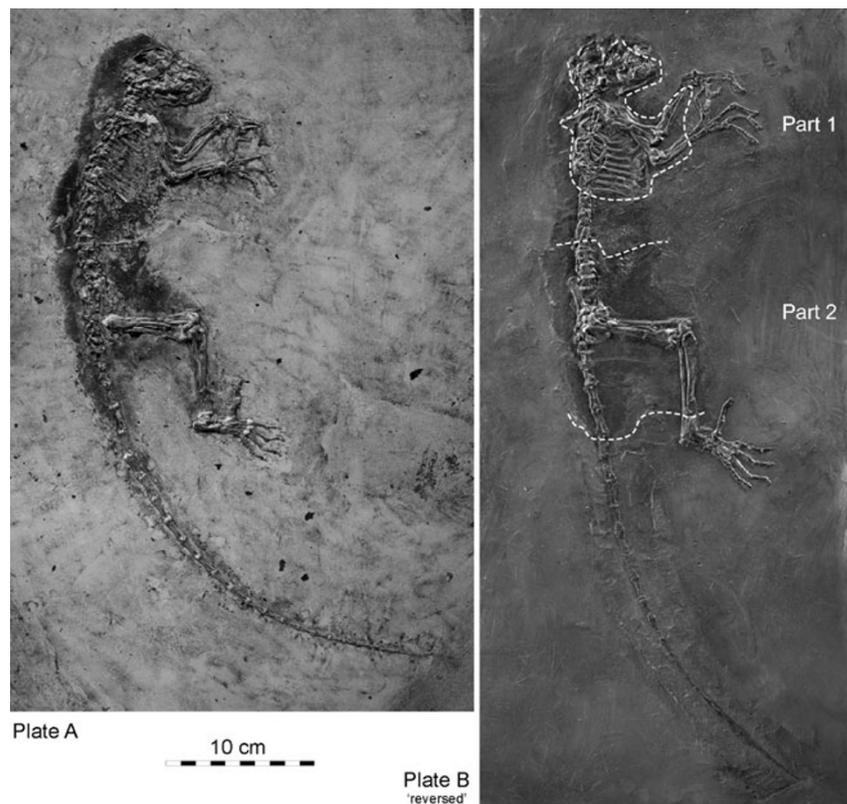
Many treatments of human evolutionary history center around hominins, the lineage to which our species and our extinct relatives more closely related to us than chimpanzees belong. And, as recognized on the basis of evidence from both paleontology and genetics, hominins themselves are anchored in a more comprehensive ape (hominoid) family tree, which is itself part of a radiation of anthropoid primates – roughly, monkeys and apes (Harrison 2010). The details of these earlier parts of primate evolutionary history remain contentious, however, and the origin of anthropoids, especially, has generated a healthy amount of debate during the past several decades (Ross and Kay 2004).

With the exception of one popular-audience book (Beard 2004), discussions about the origins of anthropoid primates have remained almost exclusively academic, but in the spring of 2009 terms like “adapiform,” “anthropoid,” “omomyid,” and “strepsirrhine” appeared in numerous news reports. Members of the public were suddenly introduced to a part of our primate family tree that they had never heard of before, and the cause of this media splash was an exceptionally preserved 47 million-year-old fossil primate from Messel, Germany, named *Darwinius masillae* (Fig. 1).

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**Fig. 1** Slab **a** (to the left) and slab **b** (to the right; dashed outlines enclose authentic skeletal material) of the Eocene fossil primate *D. masillae* (from Franzen et al. 2009b)



The new fossil primate specimen was arguably one of the most beautiful fossils ever found, rivaling even the famous “Berlin specimen” of *Archaeopteryx*, but even before its official announcement it ignited a heated debate over what our early primate ancestors looked like, the relationship between scientists and the media, and the role of science blogs in an increasingly fragmented media landscape. The announcement of *Darwinius* was just as much about how science is presented to the public as questions about anthropoid origins, and, at almost a year since the announcement of the famous fossil, it is profitable to look back to see what we have learned from *Darwinius*.

### From Death to Discovery

The story of the fossil primate that would popularly become known as “Ida” began over 47 million years ago. At that time, the place where *Darwinius* was discovered—an oil shale quarry in Messel, Germany—was a lush, warm forest inhabited by bats, crocodiles, diminutive relatives of early horses, and several primate species, all of which lived around a lake formed by a volcanic explosion almost a million years earlier (Franzen 1985; Lens et al. 2007). It

was the presence of this body of water that allowed for the exceptional state of preservation paleontologists would later marvel at.

When animals died in the ancient forest, their bodies did not have a very good chance of making it into the fossil record. Their remains would have been picked at by scavengers, trampled over by other animals, and decomposed by microorganisms, leaving nothing behind to be fossilized. If animals died at the lake’s edge or were washed in by floods, however, their bodies would have a much better chance of being quickly covered by sediment, and the harsh conditions on the bottom of the lake meant that the carcasses would not be bothered by scavengers. Only bacteria fed on the carcasses, but rather than utterly destroying the bodies, this process often caused aspects of an organism’s soft anatomy to be preserved. As the bacteria went about their dirty work, they produced carbon dioxide which, in turn, caused the mineral siderite to precipitate from the lake water, and this simultaneously killed and preserved the bacteria (Franzen 1985). The dead, entombed bacteria thus formed an image of the soft tissues of the body, preserving features that would have otherwise been lost.

It was this peculiar combination of factors that allowed an individual primate which had sunk to the bottom of the lake to become preserved, and it would remain entombed in

the rock as seas retreated, climates changed, and organisms evolved and slipped into extinction over tens of millions of years. Then in 1875, members of our relatively young species began finding fossils from the Messel site. Among the first fossils to be recovered were the scutes of extinct crocodiles, followed by the scattered remains of extinct horse relatives and other creatures (Franzen 2010). Despite these findings, however, there was no major effort to start scientific study of the site until the latter part of the twentieth century, but just as soon as the research started it seemed as if it might be halted forever. As of 1975, plans were put in action to turn the defunct oil shale quarry into a garbage dump, and both scientists and amateur collectors began to take what they could from the site (Franzen 1985, 2010; Franzen et al. 2009a).

Despite the sense of urgency felt by fossil hunters, efforts to turn the site into a landfill went slowly. By 1983, the quarry was still accessible, and upon cracking open a slab of shale one private collector found the exquisitely preserved remains of a fossil primate inside. Thus began the next chapter in the primate's story. (It should be noted, however, that plans to turn the site into a dump were scrapped. The Messel fossil pit was named a UNESCO World Heritage Site in 1995.)

The details of what happened to the fossil between the time of its discovery and its sale to the University of Oslo have already been covered in its official biography, *The Link* (Tudge and Young 2009), and so they can be briefly summarized here. When the shale containing the primate was split open, its discoverer was left with two unequal halves; one side preserved almost the entire body while the other was missing significant parts of the spine, skull, and limbs. During preparation, however, the main slab was used as a guide to fabricate the missing parts of the lesser slab, and in 1991 the partially forged slab was sold to the Wyoming Dinosaur Center. It is a testament to the workmanship of the unknown preparatory team that the partially fabricated nature of the specimen was not discovered until after the purchase had been made (Franzen et al. 2009a). It was not then apparent that it represented a new genus of fossil primate different from those previously discovered at Messel.

During this time, the more complete slab stayed in private hands, but by 2006 its anonymous owner wanted to sell it. Rather than doing so directly, however, the owner put fossil dealer Thomas Perner in charge of finding a buyer, and among the first potential customers to be contacted were German museums (Randerson et al. 2009). The museums declined to purchase the fossil, however, and so Perner thought he might have better luck at the December 2009 Hamburg Fossil and Mineral Fair where he could approach some of his previous clients, including

Museum of Oslo paleontologist Jørn Hurum (Tudge and Young 2009).

Once Hurum found out about the fossil, he, Perner, and the Museum of Oslo began negotiations to obtain the fossil. Eventually a deal was struck. A total of \$750,000 would be paid for the specimen, and both Hurum and the museum administration were confident that the specimen would be their “Mona Lisa” (Tudge and Young 2009). Fortuitously, not long after his acquisition of the fossil primate, Hurum began working with the media company Atlantic Productions to promote another of his discoveries—the skeleton of an enormous, extinct marine reptile given the B-movie moniker “Predator X” (Smith 2009). During this time, Hurum showed the fossil primate to the company's CEO, Anthony Geffen, who was so impressed that plans were started to promote the primate almost immediately (Cline 2009). An ancient “sea monster” made for good television, but a fossil primate that could be presented as one of our ancestors was even better. As Hurum organized a team of paleontologists to study the fossil, plans were also put in place to give the fossil a top-notch media debut. There would be a popular book (Tudge and Young 2009), two major network documentaries, a dedicated website, and a media blitz worthy of a rock star. All of this was planned before the scientific study of the fossil was completed (Cline 2009; Rutherford 2009).

### “Revealing the Link”

Rumors of the fossil's impending announcement began to circulate in the spring of 2009. On May 9th in a story titled “Is David Attenborough Set to Reveal the Missing Link in Human Evolution?,” the UK newspaper the *Daily Mail* stated that Hurum's fossil would be named *Darwinius masillae* in a description in the open-access journal *PLoS One* (Churcher 2009). This formal announcement, the piece stated, would be accompanied by a BBC program hosted by the famous natural history documentary personality David Attenborough in which the fossil's relevance to our ancestry would be explained.

The *Daily Mail* report was followed by a May 15, 2009 article in the American publication *The Wall Street Journal* (Naik 2009). The piece suggested that *Darwinius* might resolve a long-standing debate about the origins of anthropoid primates, though the actual paper still had not been released to the public. Paleontologist Philip Gingerich, who was one of the co-authors of the study describing the fossil and who had long been an advocate of the hypothesis that the earliest anthropoids had evolved from an extinct group known as adapiforms, was quoted as saying “This discovery brings a forgotten group into focus as a possible ancestor of higher primates.”

It was at about this time that a sensationalist press release was distributed to journalists (Switek 2009). It read as follows:

**WORLD RENOWNED SCIENTISTS REVEAL A  
REVOLUTIONARY SCIENTIFIC FIND THAT  
WILL CHANGE EVERYTHING**

**Ground-Breaking Global Announcement**

**What:** An international press conference to unveil a major historic scientific find. After two years of research a team of world-renowned scientists will announce their findings, which address a long-standing scientific puzzle.

The find is lauded as the most significant scientific discovery of recent times. History brings this momentous find to America and will follow with the premiere of a major television special on Monday, May 25 at 9 pm ET/PT chronicling the discovery and investigation.

**Who:** Mayor Michael Bloomberg; International team of scientists who researched the find; Abbe Raven, President and CEO, A&E Television Networks; Nancy Dubuc, Executive Vice President and General Manager, History; Ellen Futter, President, American Museum of Natural History

Though the press release did not explicitly mention *Darwinius*, it was soon confirmed that it was the “revolutionary scientific find” being referred to (Switek 2009), and, as scheduled, it made its debut on May 19, 2009. It was given the nickname “Ida” after Hurum’s daughter, and it was an immediate hit. A slew of news reports complemented the already-prepared media materials, and even the search engine Google celebrated the event by modifying their logo to look like the *Darwinius* fossil. Science communication expert Matthew Nisbet called this mass marketing strategy “going broad” and claimed that the media saturation was essential to bring attention to the fossil “in today’s fragmented media world” (Nisbet 2009).

Yet few people seemed to know anything about *Darwinius* other than what had been told to the media through the advance articles and the press conference. Contrary to common practice, the paper describing *D. masillae* had not been provided to journalists under an embargo, except for a very few who were allowed to read a version of the paper after signing non-disclosure agreements. The availability of the paper was controlled by Atlantic Productions, the organizers of the media frenzy, and despite the paper being available the day before the press conference, the management of *PLoS One* acquiesced with the request of the paper’s authors that the research not be distributed to journalists under an embargo (Zimmer 2009f).

Once the paper was released, scientists and journalists began looking at the technical details of the new fossil. Surprisingly, what the paper presented differed quite sharply from what was being marketed to the public. Much of the paper was descriptive, identifying *Darwinius* as a cercamoniine adapiform or a lemur-like primate belonging to an entirely extinct group whose closest living relatives are lemurs, lorises, and bush babies. For a time, this group of primates was suggested as being ancestral to anthropoid primates, especially by one of the study’s co-authors Philip Gingerich (Gingerich 1980; Gingerich et al. 1994), but this view has recently fallen out of favor (Ross and Kay 2004). Instead both fossil evidence and comparisons among living primates have placed tarsiers, and a related group of tarsier-like fossil primates called omomyids, closer to the earliest anthropoids.

Contrary to the present consensus among fossil primate experts, however, the new study proposed that *Darwinius* was closely related to early anthropoid primates. If true, this would mean that the first anthropoids may have evolved from adapiforms, and the discovery would spur a major rearrangement among early primate relationships. The researchers based this conclusion on comparisons of 30 selected characteristics seen among primates, almost half of which were soft tissue characteristics that could not be observed in *Darwinius*. Furthermore, *Darwinius* was not explicitly compared with other fossil primates, as might be expected, and despite the “surprising result” of the study—adapiforms being closely related to anthropoids—the authors equivocated in their conclusion:

Note that *Darwinius masillae*, and adapoids contemporary with early tarsioids, could represent a stem group from which later anthropoid primates evolved, but we are not advocating this here, nor do we consider either *Darwinius* or adapoids to be anthropoids.

In other words, *Darwinius* and its close adapiform kin might possibly represent the type of animal from which early anthropoid primates evolved, though the authors (by their own admission) did not wish to argue this interpretation. This was very strange. In public *Darwinius* was being presented as one of our ancestors—particularly by Hurum—while the scientific study offered a different hypothesis which its authors did not feel fully comfortable advocating. The fossil primate seemed to have two distinct identities: *Darwinius*, the object of scientific scrutiny; and “Ida,” the media darling.

## Controversy

It has not been uncommon for scientific findings to be hyped in press releases and news reports, but there seemed

to be more amiss with *Darwinius* than matters of interpretation. One of the issues of most immediate concern was that the authors of the *Darwinius* paper had not followed the procedures set by the International Commission on Zoological Nomenclature (ICZN) to have the fossil officially named. Despite the major announcements surrounding *Darwinius*, this oversight meant that, technically, the fossil had not been formally recognized. This issue was investigated by science writer Carl Zimmer on his blog, “The Loom” (Zimmer 2009a, 2009b, 2009d, 2009e). Zimmer’s involvement helped spur the journal editors, ICZN officials, and other involved parties to quickly rectify this issue and secure the official name for the fossil.

Of greater concern, however, was the fact that the authors of the paper declared no competing interests despite their close cooperation with several media companies. As related by science journalist Adam Rutherford on the website for the British newspaper *The Guardian* (2009), the book, television programs, and other promotional materials were already well developed in late 2008 when he was allowed to see the fossil after signing an agreement to secrecy.

Zimmer (Zimmer 2009c, 2009f) made similar remarks. Citing correspondence with fellow science writer Ann Gibbons, Zimmer provided evidence that the *PLoS One* paper describing *Darwinius* was held under intense secrecy until the time of the May 19 press conference. Typically significant scientific papers are released under an embargo to journalists and science writers a few days prior to their official publication date. This allows writers to research the story, contact independent experts, and prepare their articles on the research for the day of its release (with the understanding that they cannot publish their articles until the embargo lifts). Although there were rumors that the *Darwinius* paper would be released under an embargo, this did not actually occur, and while Gibbons was able to convince Atlantic Productions to allow her to see a version of the paper, she was required to sign a non-disclosure agreement to not discuss it with anyone until after the official release date.

The significance of this was that the production team behind the media event was allowed almost full control over the coverage given to “Ida.” Reporters who wanted opinions from outside experts had to act fast in order to keep up with the tidal wave of reports about the fossil. This blunted the effects of informed criticism on the story.

And, according to Peter Binfield, the managing editor of *PLoS One*, the post-review production of the paper had to be rushed to meet the May 19 deadline (Zimmer 2009f). The final version of the paper was not ready until May 18, and, by request of the authors of the study, *PLoS One*

withheld the paper until the time of the press conference. According to *Times* science journalist Mark Henderson, however, a select few news outlets were allowed to see a version of the paper by Atlantic Productions (Zimmer 2009f). Like Gibbons, Henderson had to sign a non-disclosure agreement and was not allowed to speak to anyone else about the research until the time of the press conference.

Furthermore, comments made by two scientists involved in the production of the *Darwinius* paper suggested that the media companies did influence the way in which the research was conducted. In a quote printed in *The Australian* (Dayton 2009), paleontologist Philip Gingerich was reported as saying “There was a TV company involved and time pressure. We’ve been pushed to finish the study. It’s not how I like to do science.”

Remarks made to *The Guardian* by John Fleagle, one of the peer reviewers of the research, also raised suspicions. According to Fleagle, the conclusions of the original version of the paper were much closer to what was being presented to the public. “The paper’s scientific reviewers asked that [the authors] tone down their original claims that the fossil was on the human evolutionary line,” Fleagle said, and commented that such a conclusion required intense scrutiny from the scientific community before being accepted as accurate (Randerson 2009).

The circumstances surrounding the publication of the *Darwinius* paper were unusual. The research may have been rushed, the production of the accepted paper was confined to a tight time frame, and the few journalists allowed to see the paper were hindered in their ability to responsibly report on the discovery by non-disclosure agreements. Even if the media companies did not influence the study of the fossil, it would be expected that their cooperation would be addressed to put the minds of other researchers at ease. When this issue was publicly raised (Zimmer 2009c), a comment was added to the paper which stated:

The authors wish to declare, for the avoidance of any misunderstanding concerning competing interests, that a production company (Atlantic Productions), several television channels (History Channel, BBC1, ZDF, NRK) and a book publisher (Little Brown and Co) were involved in discussions regarding this paper in advance of publication. However, to clarify, none of the authors received any financial benefit from any of these associations and these organizations had no influence over the publication of this paper or the science contained within it. The Natural History museum in Oslo will receive some royalty from sales of the book, but no revenue accrues to any of the scientists. In addition, the Natural History Museum of

Oslo purchased the fossil that is examined in this paper, however, this purchase in no way influenced the publication of this paper or the science contained within it, and in no way benefited the individual authors.

### No Competing Interests Declared

This statement was formally amended to the paper on July 24, 2009, but it did not quell the controversy surrounding *Darwinius*. In addition to the concerns previously raised, in July of 2009, a group of 11 fossil primate experts sent a letter to *Nature* decrying the high price paid for *Darwinius* (Simons et al. 2009). The purchase of the fossil for a reported three-quarters of a million dollars would foster the black market fossil trade which thrives on valuable specimens kept out of the hands of scientists and leads to the destruction of fossil sites. The concerned scientists concluded, “We believe that payments on this scale are detrimental to scientific investigation, and respectable institutions should not be responsible for making or publicizing them.”

### Enter *Afradapis*

As the controversy surrounding *Darwinius* boiled, an independent team of researchers began to describe a different fossil that would put the more famous specimen in context. In 2001, a team of paleontologists consisting of Erik Seiffert, Elwyn Simons, and their colleagues were searching the well-known Fayum desert in Egypt when they started to find the fragmentary remains of a new kind of fossil primate (Gibbons 2009). The accumulated collection of jaw fragments and over 100 teeth represented numerous individuals that, while not as well preserved as *Darwinius*, still allowed the primate to be compared to other known primate species. In the study of fossil mammals, teeth are often more diagnostic than isolated fragments of vertebrae, ribs, or limb bones—teeth can tell you a lot about what a fossil mammal was and what it was related to.

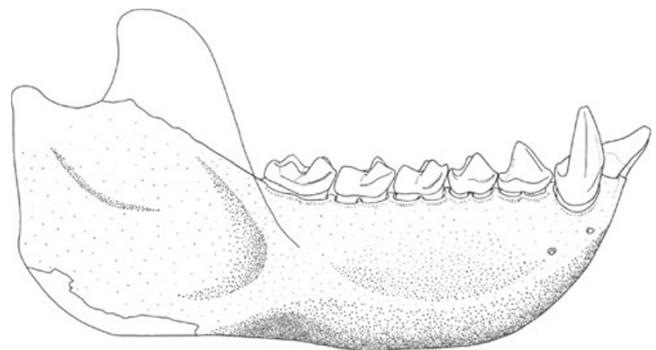
The controversial debut of *Darwinius* gave Seiffert, Simons, and their colleagues good reason to study the fragmentary remains of the Fayum primate. In addition to a description of the new species, the researchers compared a total of 360 traits between 117 different primates, both living and extinct (including *Darwinius*), to determine what the primate family tree truly looked like. If *Darwinius* was anywhere close to the ancestry of early anthropoids, it would show up in the resultant tree.

The research was published in the journal *Nature* on October 21, 2009, just over five months after the debut of

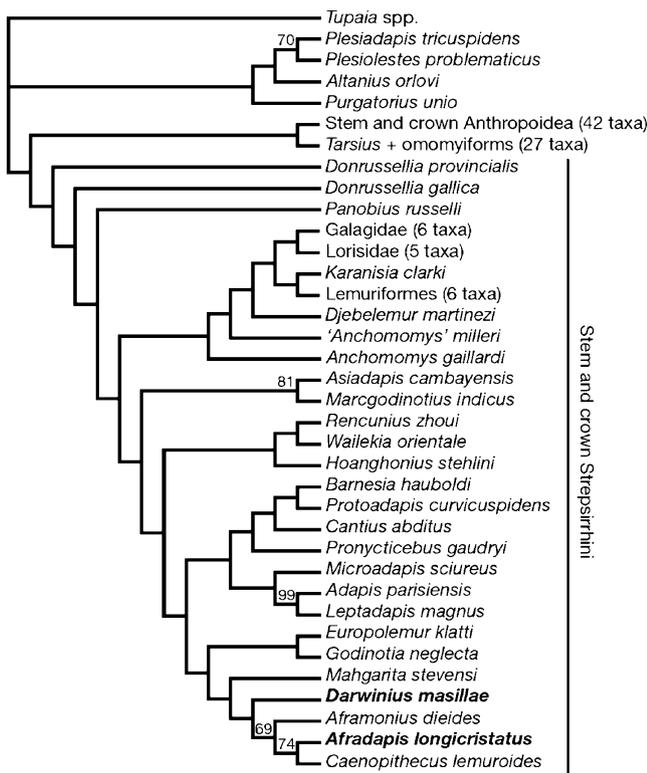
*Darwinius* (Seiffert et al. 2009). The new fossil, a 37 million-year-old adapiform primate, was named *Afradapis longicristatus*, and it turned out to be a close relative of *Darwinius* (Fig. 2). Despite living 10 million years and hundreds of miles apart, the two primates shared a number of features with each other and comprised an extinct branch of the primate family tree to which living lemurs, lorises, and bush babies are most closely related. They were about as far removed from early anthropoid primates as it was possible to be while still being primates (Fig. 3).

These relationships were underscored by what might initially seem to be a paradox. *Darwinius* and *Afradapis* did exhibit traits seen in modern anthropoid primates, but the earliest confirmed anthropoids did not yet possess these characteristics. To put it another way, *Darwinius* and *Afradapis* independently evolved traits that would later be seen in anthropoids through convergent evolution (a possibility that had been previously recognized years earlier when adapids were still considered contenders for anthropoid ancestors [Gingerich et al. 1994]). Therefore, these shared traits were not signals of a close evolutionary relationship. As had been expected through a synthesis of fossil evidence, biochemical studies, and the like, it was the tarsiers and their relatives that were grouped most closely to early anthropoids (Fig. 4).

The notion that *Darwinius* had been unceremoniously dethroned as a potential ancestor was welcomed by some researchers, but not by two members of the team that had described it. Both Gingerich and Hurum expressed their doubts about the evolutionary placement of *Darwinius* in the *Afradapis* paper, asserting that the traits that linked the primate to anthropoids were either left out or misinterpreted (Barras 2009; Bower 2009). Months earlier, in the wake of the original *Darwinius* announcement, Hurum had suggested that an evolutionary analysis of the fossil by his team was already being planned (Hooper 2009). At the time of this writing (July 14, 2010), that study has not yet appeared, but clearly we have not heard the last of



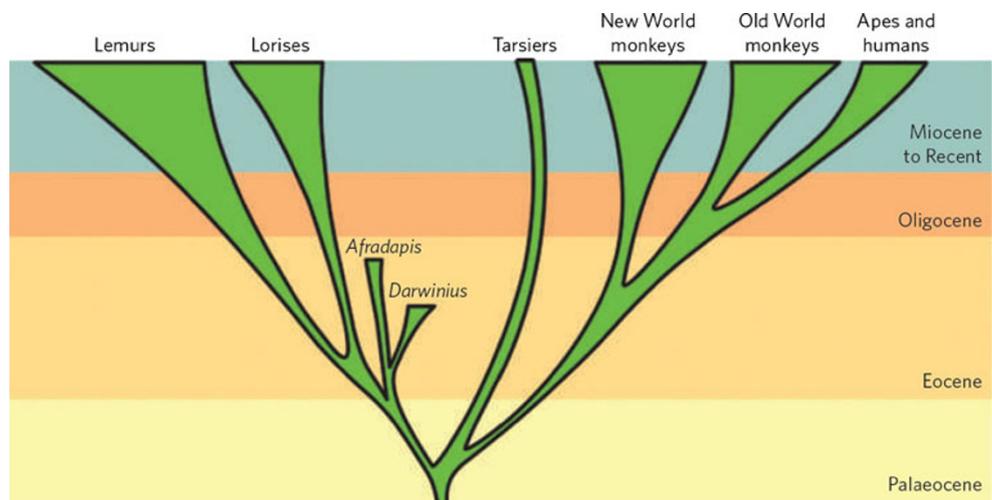
**Fig. 2** The restored lower jaw of the fossil primate *A. longicristatus* based upon multiple specimens (from Seiffert et al. 2009)



**Fig. 3** The results of a cladistic analysis of 360 traits across 117 living and extinct primate species. *Afradapis* and *Darwinius* group closely together near the bottom of the tree in proximity to lemurs and lorises, while the primates placed most closely to anthropoids are the tarsiers and omomyids (from Seiffert et al. 2009)

*Darwinius*. Research will continue, and the conclusions of both studies will continue to be scrutinized and compared to new evidence as it becomes available. At present, the weight of the evidence supports the hypothesis that *Darwinius* was an adapiform which was nowhere close to the origin of anthropoids, but this hypothesis, too, will continue to be scrutinized in the months and years to come.

**Fig. 4** An overview of the primate evolutionary tree highlighting the relationships of *Darwinius* and *Afradapis* to other primates (from Dalton 2009)



**Lessons Learned**

*Darwinius* is not the scientific sensation it was made out to be, but the entire ordeal (Horenstein 2009) contains some important ancillary lessons. First, it identified the potential pitfalls of media companies becoming involved in the promotion of new scientific research. *Ida* is hardly the first case. In 1999, *National Geographic* promoted the discovery of “Archaeoraptor” as a “missing link” between dinosaurs and birds (Sloan 1999). The magazine later had to retract this statement when it was discovered that this fossil was a chimera of bird and reptile fossils put together on the black market (Simons 2000).

These events do little to help science. Instead they often create situations that embarrass scientists by overhyping new discoveries before they can be properly studied and scrutinized by other researchers. In these situations, the tentative language that surrounds any new discovery is replaced with fantastic claims of absolute certainty, and when these initial claims turn out to be false they can become fodder for antievolutionists of varying stripes (Switek 2009e). Indeed, even though the media campaign to promote *Darwinius* may have introduced more people to science, it also presented them with a false version of science, and—as Carl Sagan rightly noted in *The Demon-Haunted World* (Sagan 1996)—corrections to fantastic claims do not usually garner as much attention to the original, overblown assertions. The reaction to the description of *Afradapis*, for example, was more lukewarm than the reception given to *Ida*. There was no book, no documentary, and comparatively little news or blog coverage.

This is not to say that scientists should never cooperate with media companies. In fact, we need more scientists to make an effort to engage the public, but there are still inherent dangers when scientists give media companies control over how their discoveries are going to be promoted.

There is no reason there cannot be a more reasonable middle ground between a lack of communication and overhyped claims, but unfortunately such productive collaborations are, at present, relatively rare.

On a more positive note, however, the affair underscored the importance of blogs in public discussions about science. Although the authoritativeness of science blogs has been questioned (Goldstein 2009), in this case science blogs played a crucial role in counteracting some of the media hype and in correcting oversights in the academic paper. The essays written by the author about *Darwinius* (Switek 2009a, 2009b, 2009d), for example, led to opportunities for increased public engagement through two editorials in the *Times* (Switek 2009c, 2009e) and two appearances on “Material World” on BBC Radio 4. More importantly though, Carl Zimmer’s posts (Zimmer 2009a, 2009b, 2009c, 2009d, 2009e, 2009f) were investigative pieces that catalyzed both the corrections that would allow *Darwinius* to be established as a valid name as well as the amendment about the competing interests of the paper. These are not everyday occurrences, but they do demonstrate the potential power of authoritative science blogging.

At present, it appears that *Darwinius* and its evolutionary cousin *Afradapis* do not represent the kind of primate from which our anthropoid ancestors evolved, yet they remain important to understanding the “big picture” of evolution among early primates. Likewise, the controversy stirred by the description of *Darwinius* introduced the public to aspects of evolutionary history they probably had not encountered previously, and though this does not justify the hype devoted to promoting *Darwinius* it may still be counted as a benefit. Journalists, scientists, and bloggers (which are not mutually exclusive categories) all came together to debate the importance of the fossil and the claims being made about it, and in some cases these resulted in significant collaborations that impacted the scientific process. Even as the evolutionary placement of *Darwinius* may continue to be debated, the 2009 controversy illustrates how emerging and established science communication forums can foster discussion and influence research.

## References

- Barras C. ‘Missing link’ Ida lacks evolutionary insights. *New Scientist*. 2009. <http://www.newscientist.com/article/dn18007-missing-link-ida-lacks-evolutionary-insights.html>.
- Beard C. The hunt for the dawn monkey. Berkeley: University of California Press; 2004.
- Bower B. Fossil find sparks debate on primate origins. *Science News*. 2009. [http://www.sciencenews.org/view/generic/id/48616/title/Fossil\\_find\\_sparks\\_debate\\_on\\_primate\\_origins](http://www.sciencenews.org/view/generic/id/48616/title/Fossil_find_sparks_debate_on_primate_origins).
- Bowler PJ. The eclipse of darwinism. Baltimore: Johns Hopkins University Press; 1983.
- Churcher S. Is David Attenborough set to reveal the missing link in human evolution? *Mail Online*. 2009. <http://www.dailymail.co.uk/sciencetech/article-1179926/Is-David-Attenborough-set-reveal-Missing-Link-human-evolution.html>.
- Cline E. Ida-lized! The branding of a fossil. *SEED*. May 22, 2009. 2009. [http://seedmagazine.com/content/article/idalized\\_the\\_brand\\_of\\_a\\_fossil/](http://seedmagazine.com/content/article/idalized_the_brand_of_a_fossil/).
- Dalton R. Fossil primate challenges Ida’s place. *Nature*. 2009; 461:1040
- Dayton L. Scientists divided on Ida as the missing link. *The Australian*. 2009. <http://www.theaustralian.com.au/news/science-divided-on-ida-as-missing-link/story-0-1225713815833>.
- Franzen JL. Exceptional preservation of Eocene vertebrates in the lake deposit of Grube Messel (West Germany). *Philos Trans R Soc Lond B*. 1985;311:181–6.
- Franzen JL. The rise of horses. Baltimore: Johns Hopkins University Press; 2010. p. 50–2.
- Franzen JL, Gingerich PD, Habersetzer J, Hurum JH, von Koenigswald J, Smith BH. Complete primate skeleton from the Early Eocene of Messel in Germany: morphology and paleobiology. *PLoS ONE*. 2009a;4(5):e5723.
- Franzen JL, Gingerich PD, Habersetzer J, Hurum JH, von Koenigswald W, et al. Complete primate skeleton from the Middle Eocene of Messel in Germany: morphology and paleobiology. *PLoS ONE*. 2009b;4(5):e5723. doi:10.1371/journal.pone.0005723.
- Gibbons A. New primate fossil poses further challenge to Ida. *ScienceNOW*. 2009. <http://news.sciencemag.org/sciencenow/2009/10/21-02.html>.
- Gingerich PD. Eocene Adapidae, paleobiogeography, and the origin of South American Platyrrhini. In: Ciochon RL, Chiarelli AB, editors. Evolutionary biology of the New World monkeys and continental drift. New York: Plenum; 1980. p. 123–138.
- Gingerich PD, Holroyd A, Ciochon RL. *Rencunius zhoui*, new primate from the late middle Eocene of Henan, China, and a comparison with some early Anthropoidea. In: Fleagle JG, Kay RF, editors. Anthropoid origins. New York: Plenum; 1994. p. 163–77.
- Goldstein AM. Blogging evolution. *Evo Edu Outreach*. 2009;2(3):548–59.
- Harrison T. Apes among the tangled branches of human origins. *Science*. 2010;327(5965):532–4.
- Hooper R. Fossil Ida’s ‘father’ defends the media hype. *New Scientist*. 2009. <http://www.newscientist.com/blogs/shortsharpscience/2009/05/idas-father-defends-the-hype.html>.
- Horenstein S. Paleontology and evolution in the news. *Evo Edu Outreach*. 2009;2(2):695–9.
- Lens O, Wilde V, Riegel W. Recolonization of a Middle Eocene volcanic site: quantitative palynology of the initial phase of the maar lake of Messel (Germany). *Rev Palaeobot Palynol*. 2007;143(3-4):217–42.
- Naik G. Fossil discovery is heralded. *Wall Street Journal*. 2009. <http://online.wsj.com/article/SB124235632936122739.html>.
- Nisbet MC. The link? ‘Going broad’ with *Darwinius masillae*. 2009. [http://scienceblogs.com/framing-science/2009/05/the\\_link\\_going\\_broad\\_with\\_darw.php](http://scienceblogs.com/framing-science/2009/05/the_link_going_broad_with_darw.php).
- Randerson J. Is fossil Ida a missing link in Evolution? *Guardian*. 2009. <http://www.guardian.co.uk/science/2009/may/19/fossil-ida-missing-link>.
- Randerson J, Pilkington E. Deal in Hamburg bar led scientist to Ida, the ‘eighth wonder of the world’. *Guardian*. 2009. <http://www.guardian.co.uk/science/2009/may/19/fossil-ida-missing-link-discovery>.
- Ross CF, Kay RF. Anthropoid Origins. New York: Kluwer Academic; 2004.

- Rudwick M. The meaning of fossils (revised edition). New York: Science History; 1976. p. 227–67.
- Rutherford A. Ida the fossil will reveal her secrets slowly. 2009. <http://www.guardian.co.uk/commentisfree/2009/may/20/fossil-ida-evolution-darwinius?showAllComments=true>.
- Sagan C. The demon-haunted world. New York: Ballantine; 1996. p. 73–6.
- Seiffert E, Perry JMG, Simons EL, Boyer DM. Convergent evolution of anthropoid-like adaptations in Eocene adapiform primates. *Nature*. 2009;461:1118–21.
- Simons LM. Archaeoraptor fossil trail. *Natl Geogr*. 2000;198(4):128–32.
- Simons EL, Ankel-Simons F, Chatrath PS, Kay RS, Williams B, Fleagle JG, Gebo DL, Beard CK, Dawson M, Tattersall I, Rose KD. Outrage at high price paid for a fossil. *Nature*. 2009;460:456
- Simpson GG. Tempo and mode in evolution. New York: Columbia University Press; 1944.
- Sloan CP. Feathers for *T. rex*? *Natl Geogr*. 1999;196(5):98–107.
- Smith L. Predator X was the most fearsome animal ever to swim the oceans. *Times*. 2009. <http://www.timesonline.co.uk/tol/news/science/article5920568.ece>.
- Switek B. Written in stone. New York: Bellevue Literary; 2010.
- Switek B. A discovery that will change everything (!!!) ... or not. 2009a. [http://scienceblogs.com/laelaps/2009/05/a\\_discovery\\_that\\_will\\_change\\_e.php](http://scienceblogs.com/laelaps/2009/05/a_discovery_that_will_change_e.php).
- Switek B. Getting to know 'Ida'. 2009b. [http://scienceblogs.com/laelaps/2009/05/getting\\_to\\_know\\_ida.php](http://scienceblogs.com/laelaps/2009/05/getting_to_know_ida.php).
- Switek B. Hype surrounding fossil find Ida has misled scores of people. *Times*. 2009c. [http://www.timesonline.co.uk/tol/news/science/biology\\_evolution/article6884423.ece](http://www.timesonline.co.uk/tol/news/science/biology_evolution/article6884423.ece).
- Switek B. Poor, poor Ida, or: overselling an adapid. 2009d. [http://scienceblogs.com/laelaps/2009/05/poor\\_poor\\_ida\\_or\\_overselling\\_a.php](http://scienceblogs.com/laelaps/2009/05/poor_poor_ida_or_overselling_a.php).
- Switek B. The dangerous link between science and hype. *Times*. 2009e. [http://www.timesonline.co.uk/tol/comment/columnists/guest\\_contributors/article6360606.ece](http://www.timesonline.co.uk/tol/comment/columnists/guest_contributors/article6360606.ece).
- Tudge C, Young J. The link. New York: Little, Brown and Company; 2009.
- Zimmer C. *Darwinius*: it delivers a pizza, and it lengthens, and it strengthens, and it finds that slipper that's been at large under the chaise lounge for several weeks.... 2009a. <http://blogs.discovermagazine.com/loom/2009/05/19/darwinius-it-delivers-a-pizza-and-it-lengthens-and-it-strengthens-and-it-finds-that-slipper-thats-been-at-large-under-the-chaise-lounge-for-several-weeks/>.
- Zimmer C. *Darwinius*: named at last! 2009b. <http://blogs.discovermagazine.com/loom/2009/05/21/darwinius-named-at-last/>.
- Zimmer C. *Darwinius*: science, showbiz, and conflicts of interest. 2009c. <http://blogs.discovermagazine.com/loom/2009/06/10/darwinius-science-showbiz-and-conflicts-of-interest/>.
- Zimmer C. Does *Darwinius* exist, revisited: the official word is ... not yet. 2009d. <http://blogs.discovermagazine.com/loom/2009/05/21/does-darwinius-exist-revisited-the-official-word-is-not-yet/>.
- Zimmer C. Does *Darwinius* exist? 2009e. <http://blogs.discovermagazine.com/loom/2009/05/20/does-darwinius-exist/>.
- Zimmer C. Science held hostage. 2009f. <http://blogs.discovermagazine.com/loom/2009/05/21/science-held-hostage/>.